AMERICAN GAS ASSOCIATION MONTHLY

Many Nations To Attend International Gas Parley at Chicago Next Month

Accelerating Seed Germination with Gas

CARL G. DEUBER

Rubber Tires Made by Gas at Fair

J. B. NEALEY

Increasing Gas Heating Sales with Aggressive Campaign

W. L. JONES

Graphic Picture of Smoke Evil Portrayed in New Book

FLOYD W. PARSONS

A. G. A. Convention Will Take Place in Chicago September 25-29

AMERICAN GAS ASSOCIATION LIGHT HEAT POWER INCORPORATED 1919

August, 1933

AMERICAN GAS ASSOCIATION MONTHLY

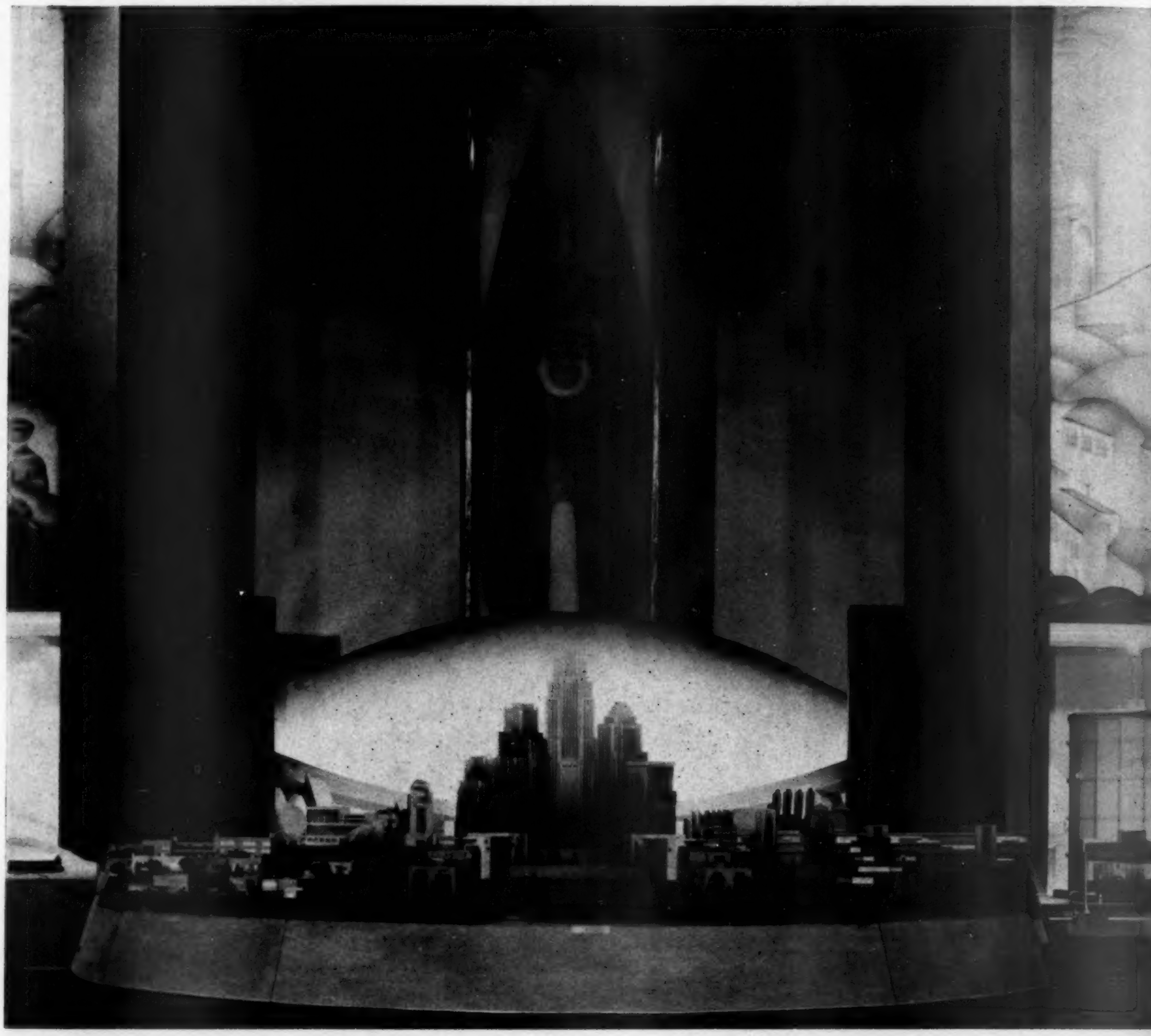
VOLUME XV | AUGUST, 1933 | NUMBER 8

CONTENTS

Published Monthly by the
AMERICAN GAS ASSOCIATION
Publication Office, American Building, Brattleboro, Vt.
Editorial Office, 420 Lexington Ave., New York, N. Y.

Entered as Second Class Matter at the Post Office at Brattleboro, Vermont, February 10th, 1922, under the Act of March 3, 1879.

Subscription Rate . . . . $3.00 a Year



THOUSANDS of World's Fair visitors at Chicago have looked upon this heroic figure, which forms the central feature of the American Gas Association Display in Gas Industry Hall. Through the giant flame may be glimpsed the *Gas Genii*, symbolic of the magic wrought by the Gas Industry. Spread below is a large smokeless city of the future, to which gas is supplied for every heating purpose.

AMERICAN GAS ASSOCIATION MONTHLY

Allyn B. Tunis, Editor

VOLUME XV — AUGUST, 1933 — NUMBER 8

Many Nations To Attend International Gas Parley at Chicago Next Month

LEADERS of the gas industry from many parts of the world will be in Chicago September 26 when International Gas Industry Day will be celebrated at the Century of Progress Exposition in honor of the International Gas Conference and Fifteenth Annual Convention of the American Gas Association.

Apart from members of the American Gas Association, who are expected in large numbers, representatives of the industry will come from the following countries: Australia, Austria, Belgium, Denmark, England, France, Italy, Japan, New Zealand, Poland and Switzerland.

Austria will be represented by delegates from Oesterreichischer Verein von Gas- und Wasserfachmanner; Denmark, by delegates from the Danish Gas Association; France, by delegates from l'Association Technique de l'Industrie du Gaz en France; Italy, from Federazione Nazionale Fascista Industrie Gas et Acquedotti; Japan, from The Imperial Gas Association; New Zealand, from the New Zealand Gas Institute; Poland, from Zrzeszenie Gasownikow i Wodociqgowcow Polskich; Great Britain by delegates from the Institution of Gas Engineers, the National Gas Council of Great Britain and Ireland, the Irish Association of Gas Managers, North British Association of Gas Managers, and Australia, by delegates from Australian Gas Institute; Belgium will be represented by the President of the Belgian Gas and Water Association, H. de le Paulle. The President of the International Gas Union, M. Mougin, of Zurich, Switzerland, is expected to be among the group of prominent visitors.

Delegates from England, France, Belgium and Switzerland plan to attend the annual convention of the Canadian Gas Association, at Ottawa, September 18 and 19. According to information reaching C. E. Paige, of Brooklyn, chairman of the American Gas Association Reception and Arrangements Committee, the Continental delegation plans to join the Englishmen and participate in a sight-seeing expedition in Canada and the United States while en route to Chicago for the Conference and Convention, which opens September 25 and will continue through September 29.

Besides Mr. Paige, the A. G. A. Reception and Arrangements Committee is composed of the following members: Arthur Hewitt, of Toronto, president of the Association; B. J. Mullaney, of Chicago, past-president of the Association, and Leigh Whitelaw, of New York. Officiating similarly in Canada will be the following committee appointed by the Canadian Gas Association: Hugh McNair, of Winnipeg, president; George W. Allen, Toronto; Arthur Hewitt, of Toronto, and Colonel D. R. Street, Ottawa.

Mr. Mullaney is not only a member of the Reception Committee but is chairman of the Chicago Committee on Convention Arrangements.

Extensive preparations have been made to receive and entertain the foreign representatives at Chicago, and members of Mr. Paige's committee will accompany the visitors on their tour of this country, which will include visits to Niagara Falls, N. Y., the Association's Testing Laboratory, Cleveland, O., Detroit, Washington, D. C., Pittsburgh, Baltimore, Philadelphia, New York, Boston and other points of interest.

At Chicago, the visitors will be guests of President Hewitt at a dinner,

and at the first general session, which will take place at Stevens Hotel, the forenoon of September 26, leaders of each delegation will be introduced to the Convention after their welcome by President Hewitt and representatives of the Exposition and the City of Chicago. F. P. Tarratt, M. Inst., C. E., Chief Engineer, Newcastle-upon-Tyne and Gateshead Gas Company and president of the British Institution of Gas Engineers, has accepted an invitation to speak at the general sessions.

As evidenced by advance hotel reservations at Chicago, it seems certain that there will be an unusually large number of American Gas Association members on hand to take part in the international gathering.

While Convention Headquarters will be at the Stevens Hotel, the Blackstone and the Congress hotels offer accommodations under special arrangements with the Association. In view of the fact that Chicago's hotel accommodations will be taxed to capacity on account of the throngs visiting the Exposition, it cannot be emphasized too much that reservations should be made promptly. Members who have not already done so are urged to make their reservations without delay through Thomas J. Gallagher, The People's Gas Light & Coke Co., 122 S. Michigan Avenue, Chicago.

Special arrangements have been made by the Association for reduced railroad fares to and from Chicago for members and dependent members of their families. Special identification forms will be mailed to all members at an early date so that members and their families may take advantage of these reduced rates.

General sessions will take place on the mornings of Tuesday, Wednesday and Thursday, September 26, 27 and 28 in the Grand Ball Room of the Stevens. Many prominent figures of the industry will take part in the programs now being arranged. Among speakers from outside the industry who will speak will be Dr. Harvey N. Davis, president of Stevens Institute of Technology, Hoboken, N. J.

On Monday, September 25, the Natural Gas Department will hold two meetings at the Stevens, at 9:30 a.m. and 2 p.m. The annual meeting and dinner of the Natural Gas Department's Executive, Managing and Advisory Committees will take place that night at 6:30 o'clock in the Tower Ball Room at the Stevens.

Speakers who will be heard at the natural gas sessions include H. C. Cooper, of Pittsburgh, chairman; George W. Ratcliffe, Manufacturers Light and Heat Company, Pittsburgh; Major T. J. Strickler, Kansas City Gas Company; Paul S. Clapp, Columbia Gas and Electric Corporation, New York; G. J. Neuner, Panhandle Eastern Pipe Line Company, Kansas City, Mo.; F. C. Hamilton, Henry L. Doherty & Co., New York; E. M. Tharp, Ohio Fuel Gas Company, Columbus, O.; Frank Wills, Pacific Gas and Electric Corporation, San Francisco; Harry E. Randall, United Gas Public Service Company, Houston, Texas, and J. H. Dunn, Lone Star Gas Company, Dallas, Texas.

Sessions of the Commercial Section will take place on Tuesday and Wednesday afternoons at the Stevens. Ac-

Tentative Convention Calendar

HEREWITH is presented a tentative calendar of events scheduled for the International Gas Conference and Fifteenth Annual Convention of the American Gas Association, which will take place at Chicago, Illinois, September 25, 26, 27, 28 and 29. Convention headquarters will be at the Stevens Hotel. The program outline, subject to change, follows:

MONDAY, SEPTEMBER 25

Registration, 9:00 a.m.

Stevens Hotel

Open Meeting, Main Technical Committee, Natural Gas Department	9:30 a.m.—Stevens Hotel
First Natural Gas Department Session	11:00 a.m.—Stevens Hotel
Second Natural Gas Department Session	2:00 p.m.—Stevens Hotel
Manufacturers' Section	9:30 a.m.—Blackstone Hotel
Natural Gas Dept. Annual Dinner	6:30 p.m.—Stevens Hotel

TUESDAY, SEPTEMBER 26

International Gas Industry Day, Century of Progress Exposition

Registration, 9:00 a.m.

Stevens Hotel

First General Session	10:00 a.m.—Stevens Hotel
First Commercial Section Session	2:00 p.m.—Stevens Hotel
First Technical Section Session	2:00 p.m.—Blackstone Hotel
First Accounting Section Session	2:00 p.m.—Stevens Hotel
First Industrial Section Session	2:00 p.m.—Stevens Hotel
Publicity and Advertising Section Session	2:00 p.m.—Stevens Hotel
President's Reception	8:30 p.m.—Stevens Hotel

WEDNESDAY, SEPTEMBER 27

Registration, 9:00 a.m.

Stevens Hotel

Home Service Breakfast	8:30 a.m.—Stevens Hotel
Second General Session	10:00 a.m.—Stevens Hotel
Second Commercial Section Session	2:00 p.m.—Stevens Hotel
Second Technical Section Session	2:00 p.m.—Blackstone Hotel
Second Accounting Section Session	2:00 p.m.—Stevens Hotel
Second Industrial Section Session	2:00 p.m.—Stevens Hotel

THURSDAY, SEPTEMBER 28

Registration, 9:00 a.m.

Stevens Hotel

Third General Session	10:00 a.m.—Stevens Hotel
Third Technical Section Session	2:00 p.m.—Blackstone Hotel

cording to the section's tentative program, addresses will be made by Walter C. Beckjord, of Boston, chairman of the section; E. R. Acker, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.; Miss Ruth Kleinmaier, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.; H. P. J. Steinmetz, Public Service Electric & Gas Co., Newark, N. J.; Hugh Cuthrell, The Brooklyn Union Gas Co., Brooklyn, N. Y.; F. M. Banks, Southern California Gas Company, Los Angeles; Bernard T. Franck, American Light & Traction Co., Chicago; Professor Philip Cabot, Harvard School of Business Administration, Boston; Morse DellPlain, Northern Indiana Public Service Co., Hammond, Ind., and C. A. Nash, United Light & Power Engineering and Construction Co., Davenport, Iowa.

Members of the Home Service Committee will hold a breakfast meeting at the Stevens on Wednesday morning.

Sessions of the Industrial Section also will take place Tuesday and Wednesday afternoons. Among those who will speak at this time, it is expected, will be H. O. Loebell, J. A. Malone, E. D. Milener, J. F. Weedon, W. F. Miller and T. J. Gallagher. A feature of the second meeting of the Industrial Section will be a roundtable discussion of all papers presented. Last year this arrangement proved so attractive and aroused so much enthusiasm at the Atlantic City Convention it was decided to repeat it at Chicago.

Details of a meeting of the Manufacturers' Section, to be held at the Blackstone Hotel on Monday morning, now are being worked out.

The Accounting Section will hold two sessions—Tuesday and Wednesday afternoons at the Stevens. Speakers on these programs will include J. M. Roberts, of Chicago, chairman; W. A. Sauer, vice-president of the Midland United Co., Chicago; W. A. Doering, The Boston Consolidated Gas Company, Boston; H. A. Ehrmann, Midland United Company, Chicago; Frank L. Hallock, New York; Jay Barton, Chicago; F. L. Daily, Cooke, Sullivan & Ricks, Chicago; M. F. Reeder, The Peoples Gas Light & Coke Co., Chicago; E. R. Rotramel, Chicago; F. R. Saunders, Pittsburgh; L. L. Dyer, Dallas, Texas; F. B. Flahive, Columbia Gas & Electric Corp., New York; H. B. Bearden; C. E. Eble, Consolidated Gas Company of New York; E. F. Embree, New Haven, Conn.; H. E. Cliff, Public Service Electric & Gas Company, Newark, N. J.; E. N. Keller, Philadelphia; P. J. Sweenie, Chicago; E. B. Nutt, Hope Natural Gas Company, Pittsburgh; J. I. Blanchfield, The Brooklyn Union Gas Company, Brooklyn, N. Y.

One or more of the foreign visitors will be heard at the sectional meetings. At the meeting of the Publicity and Advertising Section, Stevens Hotel, Tuesday afternoon, George W. Allen, of Toronto, secretary of the Canadian Gas Association, will be among the speakers, in addition to others who will present a picture of utility advertising development in this country. E. Frank Gardiner, of Chicago, president of the Public Utilities Advertising Association, is expected to speak, while Jay Barnes, of New Orleans, chairman of the section, will have a message of importance.

Three sessions will be held at the Blackstone by the Technical Section—Tuesday, Wednesday and Thursday afternoons. According to the Technical Section tentative program speakers will be as follows:

J. A. Perry, United Gas Improvement Company, Philadelphia, chairman of the section; I. K. Peck, The Boston Consolidated Gas Company, Boston, Mass.; C. A. Harrison, Henry L. Doherty & Co., New York; P. E. Eddy, The Peoples Gas Light & Coke Co., Chicago; W. H. Fulweiler, United Gas Improvement Company, Philadelphia; E. S. Brady, The United Gas Improvement Company, Philadelphia; E. J. Murphy, The Brooklyn Union Gas Co., Brooklyn, N. Y.; J. S. Haug, United Engineers and Constructors, Inc., and Fred Denig, The Koppers Co., Pittsburgh.

In view of the fact that the World's Fair is expected to prove the focal point of amusement and entertainment for the members, only one evening—that of Tuesday—will be given over to entertainment at the Stevens. Under the direction of W. G. Murfit as chairman, the Entertainment Committee promises an inviting program for delegates and members of their families.

Gaseous Lighting Wins At Chicago Fair

[Reprinted from *Electrical World*, July 22, 1933]

DARING modernistic architecture vies with electricity for recognition as the dominant characteristic of the Century of Progress Exposition. Rising to major prominence among the electrical attributes is the spectacular use of gaseous tube lighting. It is everywhere, on the building façades, on street standards, in the interiors and in the advertising displays. Thousands of feet (40,000 by one producer alone) of this tubing have been used to accentuate the architectural contours, give a sensitive touch to garish paint and, on the whole, lend a majestic and aesthetic tone to the ensemble effect.

In the careful and well-planned execution of this task gaseous tubing has forged its way out of the mere realm of commercial display and attached to itself as never before the capacity to be effective, artistic, temperamental and ornamental in areas where incandescent lighting would have entailed annoying excrescences. Well may it prove to be the emancipation of tube lighting from advertising and its large-scale adoption as a definite adjunct of architecture, interior decoration, space lighting and wall delineation. The architect and decorator will unmistakably see there the opportunity to effect contrasts, accentuate outlines and employ soft brilliance to command aesthetic attention. In so far as they respond to the surpassing display will they see the potentiality of gas-tube lighting as a companion to floodlighting for exteriors, strip lighting for interiors and interior color-screen lighting for subdued radiance.

This is the portent of the effective and extensive use of this form of illumination on the façades and portals of the Hall of Science, the Electrical Building, the General Exhibits Building, Federal Building and Social Science Hall, as well as the Grand Staircase in the Electrical Building and the Great Hall in the Science Building.

A Glimpse at Some Important Research At A. G. A. Testing Laboratory

By R. M. Conner
Director, A. G. A. Testing Laboratory

Gas cock testing machine at Laboratory

VERY few of our people realize the extent to which the American Gas Association's Laboratory engages in fundamental research work, or have any accurate idea of its most important findings in such fields. For this reason, it seems advisable to point out some of our testing agency's most important research assignments and to discuss briefly their results. It is probably safe to assume that none of our members, outside of those who in one capacity or another, are actually connected with the Laboratory, have accurate information of this kind.

Practically every research activity conducted by the Association's Laboratory is directed by some supervisory committee. If the study is one of major importance, such as the mixed gas research, for example, a committee of outstanding engineers and executives is created to control it. Moreover, where such investigations extend over a number of years, committee personnel is retained wherever possible to avoid the necessity of educating new committee members concerning work that has been completed prior to their appointment. The advantages of such a policy are quite obvious and need not be commented upon further. In some instances, one committee may supervise several research projects. The A. G. A. Approval Requirements Committee and the group directing the Association's industrial gas research are outstanding examples of this class.

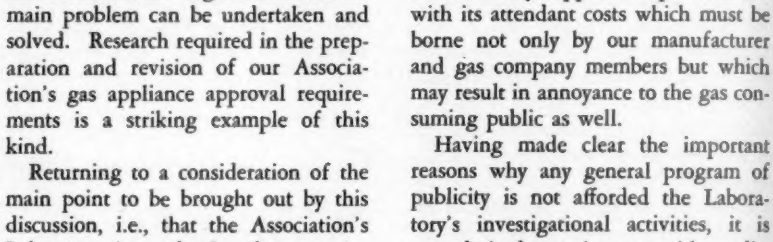
All appropriations must be approved by our Association's Executive Board for financing every research activity. Some committees request and receive funds to conduct general studies which have for their purpose the development of fundamental information which involves the completion of many minor and incidental investigations before the main problem can be undertaken and solved. Research required in the preparation and revision of our Association's gas appliance approval requirements is a striking example of this kind.

Returning to a consideration of the main point to be brought out by this discussion, i.e., that the Association's Laboratory is conducting far more investigational work than even our best-informed members imagine, the following facts are offered:

In the first place, many studies which must be carefully conducted and reported are incidental to the completion of some major problem. Second, a very large percentage of the Laboratory's findings are subject to later follow-up of the subject and cannot be published until some future time, if at all. This is particularly true of investigations affecting the performance of gas appliances. This policy is in no way unique. As a practice of industry, unfavorable research laboratory findings are not usually published, but are passed on to the interested engineers where they are used in improving the products. Our engineers, bearing in mind the main purpose of our institution, are more interested in eliminating defects than they are in demonstrating the good points of an appliance. This attitude arises from the fact that it is our mission to avoid, in so far as possible, unsatisfactory appliance performance with its attendant costs which must be borne not only by our manufacturer and gas company members but which may result in annoyance to the gas consuming public as well.

Having made clear the important reasons why any general program of publicity is not afforded the Laboratory's investigational activities, it is now desired to point out, without discussing detailed results, some of the more important problems of this nature that have been completed during the past few years.

In 1927, a study of the basic theories underlying the practice of gas mixing was initiated. This work was concluded early in 1933. Various summary reports covering the results of this extensive investigation, which involved the consideration of more than 250 different gas mixtures and the completion of approximately 175,000 separate



Part of the equipment used in industrial gas research at the Laboratory

Laboratory equipment used for testing draft hoods

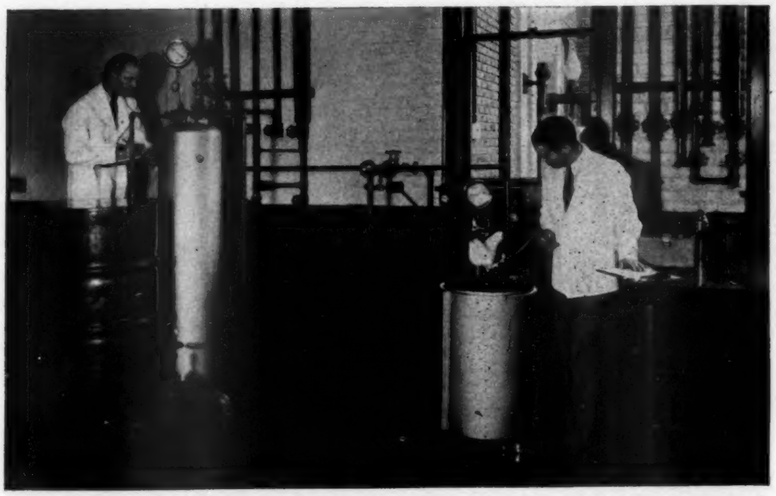
tests, have been made available to member company delegates applying to Association Headquarters. Authorities commenting on these publications point out the fact that they are by far the most important ever published on the subject, and that they supply our engineers with authoritative and most valuable treatises on this subject. One of the outstanding accomplishments in connection with this problem, was the development of an empirical formula which permits engineers with the usual amount of information available, to determine mathematically, and without conducting long and expensive field tests, the suitability of various gas mixtures for utilization purposes.

A very helpful study on cast-iron bell and spigot joints was started in 1929 and concluded last year. This investigation demonstrated the mistake of using such types of joints for conveying gases other than at relatively low pressures, and also resulted in affording the industry some extremely valuable information on various kinds of gasket materials and the merits of different designs of bell joint clamps. Another study of a somewhat similar nature was carried on at the same time for and at the expense of the Cast Iron Pipe Research Association. This experimental work was confined largely to tests on mechanical joints and has resulted in effecting many improvements in joints of this kind. One particularly significant feature connected with completion of these two problems was a decision on the part of our Pipe Joint Committee to prepare test standards for bell joint clamps and mechanical joints. The Laboratory has assisted considerably in this work, and if it is carried to completion it should result in the testing and certification of bell joint clamps and mechanical joints in a manner somewhat similar to that now being carried out on domestic gas appliances.

A rather logical outgrowth of the great amount of study and time devoted to pipe joints was the creation of a desire on the part of our distribution engineers to know more about welding and welded joints. Initially, there was a feeling that the art of welding itself should be studied. A preliminary investigation of present practices, however, indicated that very satisfactory joints could be prepared, with reasonable skill on the part of the operator, either with gas or electric arc welding equipment. Consequently, it was decided that the most useful purpose could be served by developing a practical method for testing welded joints in the field. Work of this nature was undertaken early in 1932 and is still in progress to a limited extent. While this study has not been entirely concluded, a weld test meter has been developed that provides a very accurate means for indicating the quality of welded pipe joints. The remaining work required to satisfactorily conclude this problem, revolves largely around the application of this instrument to practical conditions existing in the field.

A number of interesting studies have likewise been carried on in the industrial gas field. Such investigations were initiated and are being supervised by the Association's Industrial Gas Research Committee. Three very important problems, one on recuperation, another on the elimination of burner noises, and the third on a study of combustion space requirements, have been assigned to our testing establishment and have been under way to a greater or lesser extent during the past three years. Investigational work on the principles of recuperation has been

A.G.A. Laboratory method of observing the surface temperatures of gas range ovens



Laboratory test equipment used in studying the operating characteristics of relief devices

concluded. A very valuable review of this subject is contained in Laboratory Report No. 685. This bulletin is one of the most complete treatises ever offered on the subject and possesses the distinct advantage of having been prepared particularly for the use of the industrial gas man. A preliminary report has also been supplied on burner noise elimination research. This material is entirely original and should promote a great deal of constructive thought leading to the elimination of noise in industrial gas burner applications. This is an activity that should unquestionably assist greatly in promoting the use of gas in industrial operations. The same thing may appropriately be said of the combustion space requirements study. This problem, if satisfactorily concluded, should supply the only appreciable amount of basic information ever obtained on the subject and should greatly assist all engineers designing industrial gas furnaces in the future.

During the Association's last fiscal year, some forty-eight major studies were completed in determining the performance characteristics of various types of domestic gas burning appliances. It would be impractical to attempt to even outline their scope, although it is hoped to present a general idea of their value to the gas industry. These investigations range all the way from the development of a satisfactory method for rating gas-steam radiators to a determination of the desired functions of a satisfactory draft hood. Almost every conceivable aspect of a gas appliance's construction and performance is investigated during these studies. While the primary object of this work is to determine the results that a satisfactory appliance should accomplish, very complete reports are made covering these studies and they are placed in the Laboratory's files where they assist later in supplying valuable data for other similar investigations.

In addition to supplying data upon which equitable test requirements may be based, such research supplies a practical means of effecting improvements in the performance of practically every kind of domestic gas appliance. There is no doubt these studies have been conducive to many of the modern improvements brought about during the past three years, particularly in gas ranges. It is fortunate, of course, that this situation exists, especially for the reason that gas burning equipment has undergone greater changes during the past three years than it did in the previous fifteen years.

One striking example of the manner in which our Association's testing establishment is assisting appliance manufacturers and the industry, is a study recently undertaken on automatic and safety features of gas ranges. Satisfactory conduct of this problem necessitates a thorough knowledge of combustion characteristics of many different kinds of gases, some of which are quite expensive to prepare synthetically and which involve the assembly of elaborate test set-ups. Very few manufacturers of gas ranges if any could afford, in these times particularly, to incur such large expenditures, and under no circumstances would they ever have at their disposal the vast amount of helpful information that has been assembled at the Laboratory during the eight years of its existence.

Although the results of requirements research which is financed by the American Gas Association are not passed on directly to our manufacturer members, they are reflected in the requirements which their appliances must meet if they are submitted for Laboratory approval. Consequently, the ultimate results are about the same. Collectively speaking, these studies amount to a general and cooperative research program financed largely by the interested trade association for the gas industry, in the interest of, its equipment manufacturers, its gas company members, and what is more important, in the interest of its consumers.

During the past seven years, the American Gas Association's Laboratory has concluded or initiated eight major research programs, one of which required five and one-half years for completion. Furthermore, approximately 325 minor studies had been concluded at the beginning of the present fiscal year and some 52 additional ones of a similar nature should be completed during this year. These statistics probably tell the story better than words.

It is hoped that the writer has brought out the fact that the Association's testing agency has been considerably more active in the field of basic research than even those rather closely in touch with its operations suspect. This condition is as it should be, for an adequate and continuous research program is one of the most effective means of insuring any industry's continued success.

Miss Feeney Appointed Home Service Director

MISS RUTH FEENEY, formerly domestic science instructor in the high schools of Milwaukee, Wisconsin, has been appointed director of the home service department of the Boston Consolidated Gas Company, Boston, Mass.

Accelerating Seed Germination with Gas

By Carl G. Deuber

Assistant Professor of Plant Physiology
Yale University

DURING the spring of 1932, while carrying on a series of experiments dealing with the influence of illuminating gas on trees[1] 600 or more oak acorns of three species were given treatments with illuminating gas for various periods of time and then placed under conditions suitable for germination. This preliminary work indicated that gas treatments of acorns for 6, 24, and with some, 96 hours, very materially hastened the rate of germination. Since then a number of additional tests of the effects of illuminating gas, ethylene and the vapors of ethylene chlorhydrin have been made upon acorns and other seeds. The results obtained with black oak acorns, wheat, tomato, lettuce and Canada field pea seeds comprise the subject matter of this report.

The earlier experiments indicated that the acorns of black oak trees apparently had a greater degree of dormancy than those of red or scarlet oak trees, therefore black oak acorns were chosen for the present study. The acorns were collected locally in November, stratified in moist peat moss in a cool basement room until treated in December.

In this experiment, all of the gas treatments were for a twenty-four-hour period. The procedure with the "mixed" illuminating gas supplied to the laboratory outlets by the New Haven Gas Light Company, was to place 100 acorns in a one-liter Erlenmeyer flask, fill it with tap water, invert the mouth of the flask under water and displace the water with illuminating gas. The flask was then stoppered under water and set aside at room temperature for twenty-four hours. Planting of the acorns consisted of pressing them in a layer of sand in a 12-inch clay saucer which was then covered with a second inverted saucer. These germinators were kept in a warm greenhouse and maintained in a moist condition with tap water. A second treatment consisted in preparing a mixture of 50 per cent illuminating gas and 50 per cent air in a large bottle from which it was forced out by water into a liter flask containing 100 acorns. Ethylene and air mixtures were prepared in a similar manner, the ethylene being obtained from a small tank supplied by the Ohio Chemical Company. Treatment of the acorns with the vapors of ethylene chlorhydrin consisted in placing 2 cc. of this chemical on a small wad of cotton held at the rubber stopper which sealed the flask.

The germination percentages as they were taken at weekly or biweekly intervals over a period of 151 days are given in Table 1.

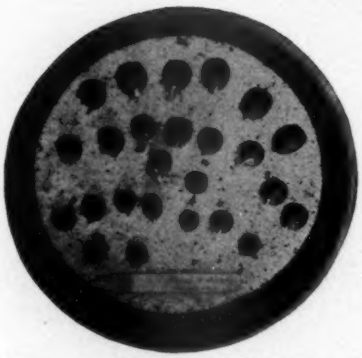
When examining these germination data of black oak acorns it must be remembered that these acorns are normally dormant from the time they drop from the trees in the fall until the following spring. Also, that tree seeds with a definite dormant period and frequently those without such a rest period, do not germinate uniformly and promptly like most agricultural crop seeds but have a more or less extended period of germination when any considerable number of seeds is involved. These data indicate the principal facts to be derived from this experiment, namely, that each of the gaseous treatments hastened germination appreciably as compared with the control lot. The first 10- and 39-day germination percentages are considered to be especially significant. A mixture of 50 per cent illuminating gas and 50 per cent air is probably the quickest acting stimulant for the germination of these acorns followed closely by 1.25 per cent ethylene. At the conclusion of the test the remaining ungerminated acorns were cut open and examined to see if they were still viable, diseased or chemically injured. The treatment with the vapors of ethylene chlorhydrin was the only one producing chemical injury. The re-

Table 1

COURSE OF GERMINATION OF BLACK OAK ACORNS SUBJECTED TO TREATMENT WITH SEVERAL GASES ON DECEMBER 22, 1932, FINAL GERMINATION DATA MAY 22, 1933.

Days from Planting	Per Cent Acorns Germinated					
	Control	100% "Mixed" Gas	50% "Mixed" Gas	2.5% Ethylene	1.25% Ethylene	2 cc. Ethylene Chlorhydrin
10	7	43	32	21	25	20
16	17	57	45	26	46	56
26	22	62	79	60	69	66
32	28	68	85	72	75	76
39	44	73	88	73	76	80
46	51	74	90	79	80	81
53	52	76	91	79	83	83
60	54	77	91	79	90	87
67	58	81	91	81	93	88
80	63	82	92	84	94	88
87	69	82	92	85	95	88
94	72	82	92	86	95	88
109	82	87	92	91	95	88
123	84	89	93	93	95	88
151	85	90	93	94	95	88
No. viable but ungerminated	11	6	2	1	3	0
Diseased acorns	4	4	5	5	2	0
Chemically injured	0	0	0	0	0	12

[1] Deuber, C. G. Stimulative effects of illuminating gas on trees. Science 75: 496-497. 1932.



Acorns of red, scarlet and black oak trees that were subjected to gas for three days showing germination eleven days after the treatment

maining ungerminated acorns of this lot were all blackened and this discoloration was attributed to chemical injury.

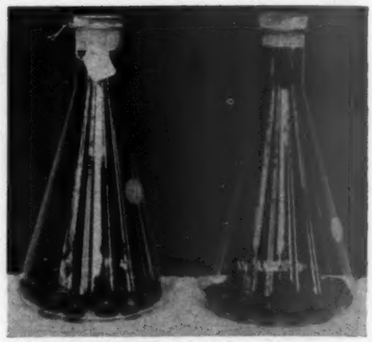
About five hundred of the gas treated and germinated acorns were planted in soil or sand in the greenhouse and made normal development during the early spring. Several hundred of these seedlings were transplanted in the City of New Haven shade tree nursery.

A second series of black oak acorns were subjected to 24-hour treatments with the vapors from 2, 4 and 6 cc. of ethylene chlorhydrin, respectively, in one liter flasks on November 14, 1932. At 35 days from planting, the germination percentages from these three vapor treatments were 59, 40 and 41, respectively, and of the control lot, 25 per cent. But at 77 days from planting it was evident that the vapors of ethylene had had a toxic effect upon a large number of the remaining acorns for the germination percentages, given in the same order as above, were 61, 46 and 45 per cent, and of the control lot 88 per cent.

The favorable results obtained in hastening the germination of black oak acorns by treatment with several gases made it desirable to know the effects on seeds that do not have an extended period of dormancy. The first species tested was wheat, variety Leap's Prolific. Seventeen lots of 100 seeds each were counted out and each lot tied in a small square of cheesecloth and placed in 125 cc. flasks. Coke oven gas, the type of gas supplied during the summer period by the New Haven Gas Light Company, was introduced into eight flasks by water displacement. The seeds were gassed for the following periods of time: 15, 30 and 60 minutes, 2, 4, 8, 12 and 24 hours. To gain an idea of the influence of enclosing these seeds in stoppered flasks with the consequent decrease in oxygen supply and increase in carbon dioxide due to respiration, nine lots were placed in 125 cc. flasks, one was left open and the remainder were stoppered for the time periods indicated for the gas treatments given above. The average germination per cent of the 800 seeds subjected to gas treatments after two days was 78.3 per cent, that for the 900 seeds in the open and in the stoppered flasks was 79.2 per cent. The highest germination was in the open flask, 88 per cent, but the first roots of the seedlings in the gas-treated lots were longer and more abundantly supplied with root hairs than those of the open flask. The roots of the seedlings subjected to four hours of enclosed air were three to four times longer than those of the other lots of this series and were the only lot that equalled those of the gas-treated seedlings in root length and abundance of root hairs. Of the time periods used for the gas treatments, the 15- and 30-minute periods, were considered the best. No inhibition to germination was noted even in the lot gassed for 24 hours.

Tomato seed, variety Bonny Best, were subjected to "mixed" illuminating gas in 125 cc. flasks for 15, 30, 60 minutes, 3 and 24 hours, respectively. Similar lots of 100 seeds each were placed in stoppered flasks as controls. In but one instance, 15 minutes "mixed" gas, did a gassed lot give a higher germination percentage in five days than its corresponding control lot. The enclosed air lot germinated to the extent of 80 per cent, the gassed lot to 90 per cent. The average germination percentage of the five gassed lots was 84.0 and of the enclosed air lots 88.8 per cent. In general, this gas treatment did retard germination of tomato seed and also retarded root hair development.

In a second experiment with tomato seeds lots of 100 seeds were enclosed in 125 cc. flasks filled with



Method for treating oak acorns in one liter Erlenmeyer flasks

a mixture of 10 per cent ethylene and 90 per cent air for periods of 15, 60 minutes and 24 hours. At the same time, three lots of lettuce seed, variety, New York, were similarly treated. Germination of the tomato seed was very little, if at all, influenced by this ethylene treatment, the average germination of the three lots after six days being 47.0 per cent and of the control lots 48.6 per cent.

The lettuce seed, however, was appreciably accelerated in the rate of germination by the gas treatment. In 24 hours from the time the seeds were placed on filter papers in Petri dishes to germinate, the lot subjected to ethylene for 24 hours showed 27 per cent of the seeds with roots 1 to 2 mm. long while the corresponding control lot had one seed of the hundred with a root just emerging. In ten days, the final average germination percentages were 31.0 for the ethylene treated seeds and 14.3 for the control lots. The seedlings from the ethylene treated lettuce seeds continued to be larger and more vigorous than those of the control lots.

Tomato, lettuce and Canada field pea seeds were then subjected in 125 cc. flasks to 10 per cent ethylene and the vapors from 0.1 cc. of ethylene chlorhydrin for 24 hours together with untreated control lots in stoppered flasks. The tomato seed was somewhat retarded in its germination by the 10 per cent ethylene treatment, the germination per cent at the end of eight days being 90 while that of the control lot was 98. The ethylene chlorhydrin vapor treatment was distinctly toxic, only

one seed germinated. The results with lettuce seed were similar to those with tomato seed except that no retardation of germination occurred with the 10 per cent ethylene treatment. This and the control lot both had germination per cents of 93 at the end of five days. None of the lettuce seeds treated with the vapors of ethylene chlorhydrin germinated. The Canada field peas differed in the responses to the gas and vapor treatments observed with tomato and lettuce seeds in two respects. First, the 10 per cent ethylene treatment for 24 hours accelerated the rate of germination and the final germination per cent was 88 while that of the control lot was 76 per cent. Second, while ethylene chlorhydrin retarded germination somewhat it did not injure these seeds as it did tomato and lettuce seeds. The final germination per cent was 70 as compared with 76 for the control lot.

Canada field peas were then subjected to ethylene concentrations of 10, 20 and 50 per cent in 125 cc. flasks for 24 hours. During the first day after these treatments there was a retardation in the germination of the seeds exposed to 50 per cent ethylene but during the second day the germination rate was particularly high in this lot and the inhibiting effect was lost. During this second day, two peas in the 50 per cent ethylene treated lot exhibited a double curl of the root similar to that of a corkscrew. The final germination percentages at the end of five days for the 10, 20 and 50 per cent ethylene treated lots were 96, 93 and 94, respectively, and for the control lot 92 per cent.

The influence of four concentrations of ethylene chlorhydrin vapor treatments on Canada field peas were further tested by placing 1 cc. of this chemical on a piece of cheesecloth over 100 seeds in a 125 cc. flask; 1 cc. of a 10 per cent solution of this chemical; 1 cc. of a 1 per cent solution; and 1 cc. of a 0.1 per cent solution. All of these vapor treatments were for 24 hours. The strongest concentration, 1 cc. of ethylene chlorhydrin in a 125 cc. flask, killed all of the seeds in this lot, but the two weakest concentrations accelerated germination during the first 24 hours as compared with the control lot and the second strongest concentration. The final germination percentages recorded after five days for the ethylene chlorhydrin treatments with 1 cc. of the undiluted chemical was 0 per cent; that for 1 cc. of a 10 per cent solution was 77 per cent; that for 1 cc. of a 1 per cent solution was 75 per cent; and that for 1 cc. of a 0.1 per cent solution was 82 per cent. The control lot germinated to the extent of 85 per cent.

Summary and Conclusion

These experiments in which the seeds of five species of plants were subjected to an initial exposure to two or more of the following gases: "mixed" and coke oven commercial illuminating gases, ethylene and the vapors of ethylene chlorhydrin indicate that these gaseous treatments may accelerate the rate of germination and in some cases the early growth made by the seedlings; these treatments may be highly toxic or they may have no apparent effect. These different responses appear to be largely determined by differences resident within the seeds but modified by the gas used, its concentration and the length of the exposure. Internal differences between seeds of various species of plants are difficult to analyse with any degree of assurance. In the group of seeds used in this study, the black oak acorns are recognized as having a fairly well defined period of dormancy. The untreated lettuce seed did not germinate readily while the wheat, tomato and Canada field pea seeds germinated to a high degree and promptly without artificial treatment of any kind. The black oak acorns, wheat, lettuce and Canada field pea seeds were accelerated in their rate of germination by one or more of the gaseous treatments while the tomato seed was retarded or showed no apparent effect by any of the treatments. The tomato seed was more sensitive to injury by the gaseous treatments than the others. No logical reason for this fact is at hand.

It is not possible to evaluate the effectiveness of the several gases in accelerating seed germination since they were not all employed simultaneously with each species of seeds. It is quite clear, however, that the treatment with vapors of ethylene chlorhydrin was the most toxic treatment. However, Canada field peas were less injuriously affected than the other seeds. Also, when this vapor treatment did not kill the seeds it frequently accelerated germination. The writer[1] has used the vapors of ethylene chlorhydrin successfully in a previous study of red and black oak acorn germination.

Ethylene and propylene, respectively, but in much lower concentrations than ethylene was used in the present study have been employed by Vacha and Harvey[2] to break the rest period of buckthorn, high bush cranberry, snowberry and Tartarian honeysuckle seeds. Ethylene appears to have marked properties as a seed stimulant.

It is quite clear that illuminating gases such as the "mixed" and coke oven gases used in these studies accelerate the germination of some seeds. The ingredients responsible are difficult to determine out of the complex composition of these commercial gases. It may be the high carbon monoxide content, the unsaturated hydrocarbons, a lack of oxygen or a combination effect. Ethylene, one of the constituents, has been shown to act similarly to these illuminating gases in the responses produced in the seeds tested.

These experiments were prompted by previous work which showed that illuminating gas may act as a stimulant to dormant trees. This study shows that some dormant seeds may be accelerated in their rate of germination and that some seeds without a well-defined dormant period can be caused to germinate promptly by treatments with illuminating gases, ethylene and the vapors of ethylene chlorhydrin. The biochemistry and physiology involved in accelerated germination of gas treated seeds awaits investigation. From a practical standpoint, seeds with very long periods of dormancy are frequently encountered among species valuable in horticulture and forestry. While it is impossible at present to lay down specific directions for treating dormant seeds generally due to the differences to be found between the various kinds of seeds yet it appears that gas treatments similar to those used in this study may prove of real value in many instances. While the writer prefers to use ethylene for accelerating seed germination the two commercial illuminating gases used in this study proved to be quite satisfactory as well as convenient.

[1] Deuber, C. G. Chemical treatments to shorten the rest period of red and black oak acorns. Journal of Forestry 30: 674-679. 1932.

[2] Vacha, G. A. and R. B. Harvey. The use of ethylene, propylene and similar compounds in breaking the rest period of tubers, bulbs, cuttings, and seeds. Plant Physiology 2: 187-192. 1927.

Legislature Declines to Regulate Gas Rates

THE Massachusetts Senate has rejected a bill to regulate the price of gas in the Hyde Park district of Boston, in Dedham and in part of Westwood.

Welcome awaits you at Gas Industry Hall at the Century of Progress Exposition.

Now Can Use Native Natural Gas

The North Dakota Legislature recently passed a bill permitting the use of natural gas in State institutions provided the gas is produced in that State. North Dakota has had a law on its books since 1893, which had been interpreted to mean that State institutions must use local lignite coal and the law now permits the use of native natural gas on a parity with native coal.

Graphic Picture Of Smoke Evil Portrayed in New Book

By Floyd W. Parsons

ANYONE familiar with the voluminous and complex mass of literature on the smoke nuisance knows only too well what a man's size job awaits the person who attempts to produce an authoritative book on the subject. Tough as it is, however, the task has been undertaken and after three years of steady attack has been successfully completed.

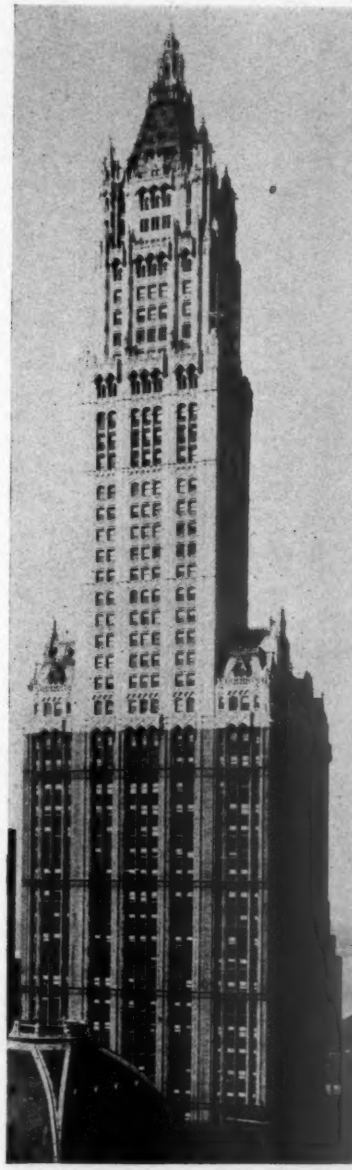
The result is "Stop That Smoke!" a 289-page volume published by Harper & Brothers. Although the smoke nuisance is centuries old and has been one of the most persistently discussed and inveighed against scourges of civilization, this is the first time that a graphic and comprehensive picture of the evil has been portrayed within the covers of a single book. "Stop That Smoke!" thus claims the distinction of being the first and only treatise of its kind—an honor of some consequence in an age when books are more numerous than measles.

Of equal importance also is the fact that the author is a member of the gas fraternity. He is Henry Obermeyer, vice-chairman of the Publicity and Advertising Section, American Gas Association, and assistant to Vice-President Oscar H. Fogg, of the Consolidated Gas Company of New York. Before joining Colonel Fogg's staff, Mr. Obermeyer was editor of THE MONTHLY. Here he became an ardent enthusiast and active crusader for gas fuel. Many an author has written a stinging philippic on smoke in the daytime, only to return home in the cool of the evening and stoke up the coal furnace. Not so, however, with Henry Obermeyer. His is an all-gas home.

Separating the chaff from the wheat, discarding the theories of the crank and publicity seeker, and selecting only those corrective measures that have stood up under scientific test and the proof of practical application, Mr. Obermeyer's book rings true and presents an overwhelming array of striking evidence against smoke and its ravages. His statements are substantiated by reference to medical and health authorities, to chemical sanitation and other engineers, to scientific observers and investigators of acknowledged reputation. The damaging effects of smoke, its dangers to life and property, its wastes, its ugliness—these are all treated in a manner that carries conviction.

"Stop That Smoke!" exposes the smoke nuisance for what it is—an arch enemy of all mankind. The book, however, is no mere flash attack or bombardment against the evil, written by one who is hopelessly biased. Mr. Obermeyer has striven hard to present an honest and impartial analysis of the subject. There are more facets to the smoke problem than there are to the notorious Hope diamond, yet every one of them is identified and described in terms that the layman can understand. There is even a chapter telling how to stoke a furnace with ordinary coal and still run a smokeless fire.

This is no book to digest at a single sitting; it is an all-inclusive and authentic reference work. There is a wealth of helpful information in it for everyone who is in need of the proper tools with which to fight atmospheric pollution. In "Stop That Smoke!" the mechanical engineer interested in smoke prevention equipment will find what he wants to know; the doctor will discover the health aspects of the evil fully covered; the lawyer is provided with good and bad examples of anti-smoke ordinances; civic agencies concerned with the problem are told what has been done and what can be done to abate the nuisance and there is a variety of other information of special



The Woolworth Building, New York, half-cleaned. $1,600,000 is spent in New York to clean buildings every year

appeal to all fighters for pure and uncontaminated air, including advice on the organizing of public opinion and the most effective ways of starting and carrying on an aggressive warfare against the evil.

Mr. Obermeyer shares the conviction of many experienced campaigners against smoke that the war can be won if the public can be induced to snap into the fight with energy and deter-

(Continued on page 349)

Increases Gas Heating Sales By Aggressive Campaign

One of ten seasonal messages used on illuminated bulletin boards by The St. Louis County Gas Company to keep up gas heating sales

By W. L. Jones

Sales Manager,
The St. Louis County Gas Company

ANYBODY can be so conservative that he does nothing to help himself. Anybody can sit and wait for economic necessity to drive business in to him. Anybody can lock himself in the hurricane cellar until the depression blows over. But to go out and get business in the face of mounting sales resistance requires what we may call fighting salesmanship.

On the other hand: Anybody can give goods away. Anybody can take business from the competition by underselling them regardless of cost. Anybody can make sales if the weight of advertising and high-pressure selling be great enough. But to go out, in the face of the depression, and build substantial sales volume, of a sound and lasting sort, at costs that are in line, requires that fighting salesmanship be preceded and guided by constructive planning.

Some of us in the gas business are of the opinion that an aggressive policy on gas heating, if coupled with clear thinking in the use of advertising and selling, can do wonders for the industry.

Constructive fighting salesmanship will do a job that cannot be matched by pussy-footing on the appeal and camouflaging on the price of the equipment, with extreme inducements on down payments, monthly payments and rental schemes. Let us put our prices on a sound business basis. Let us throw off the fear of negative advertising and negative selling. Let us buy the advertising coverage that is needed. Let us equip our men with selling tools to smash down sales resistance. The results will justify our efforts.

The St. Louis County Gas Company is in the second year of a gas heating sales drive, which contains little that is sensational but does possibly exemplify the foregoing principles sufficiently to be worth a brief description. This campaign naturally has not been free from errors, but we like to think of it as similar to the work of a shortstop who tries for everything and who, in consequence, often shows in the "error" column but also covers a lot of ground and figures prominently in the "put-out" and "assist" columns.

All sales of gas heating equipment are preceded by the preparation of gas heating estimates. There is a definite—though changing—relationship between the number of estimates submitted and the number of sales resulting. In 1929, we were closing nearly one-half of the attempted sales, the percentage of estimates which resulted in sales being 47 per cent. As sales resistance increased, the percentage fell. In 1930 it was 39 per cent; in 1931, 27 per cent. If the same rate of decline continued into 1932 our percentage of sales-to-estimates would have been down well under 20 per

Showing sales visualizer that proved valuable document to increase gas heating sales

cent. In other words, we should have had to be so effective with our advertising as to produce five or six inquiries to every sale we proposed to make.

It seemed reasonable to believe that the cause of the declining ratio was the increasingly depressed condition of general business. Therefore for the sake of exact knowledge in place of an "impression," a comparison was made between the ratio of sales-to-estimates and the trend of St. Louis bank clearings—and it was found that the rate of decline was very similar! If, therefore, general business should continue downward through 1932—as afterwards proved to be the case—we would have to expect a corresponding decrease in our ratio.

Vigorous steps therefore were taken to help the salesmen sell a greater proportion of their prospects. Among other expedients, a sales visualizer of a new sort was planned. A description of this follows, but we may as well at this point jump to the "happy ending" of the story: The rate of decline in our percentage of sales-to-estimates was "pegged" at 24 per cent, thus requiring but a trifle more than four inquiries—instead of 5 plus—to produce one sale. The definite economy of the step is thus clearly evident. Any successful means of improving salesmen's results, such as an effective sales visualizer, is an economizer not only of the salesman's time but of advertising cost!

The problem of the best sales approach to use both in the visualizer and in the inquiry-getting advertisements was solved by making a searching study of the public's attitude. This was not the ordinary casual "survey" by questionnaire, but a personal research made by a trained investigator and reporter charged with the responsibility of finding out exactly why people buy gas heating when they do buy it, and what are the mental obstacles that have to be overcome to induce people generally to consider our proposition.

Naturally a great number of reasons were discovered but, boiled down, the report read:

1—That gas heat is bought for the elimination of dirt in the house and of work for the women of the household.

2—That the chief mental obstacle was not an inability to believe that gas heat eliminates dirt and work, but an impression that the cost of gas heat put it so far out of consideration that there was no use even thinking about it. Almost universal comment: "Sure, it would be nice to have gas heat, but I'm no millionaire."

It will be seen how ineffective the usual gas heating arguments are in the face of this conviction. Basements made over into game rooms, furnaces regulated from rocking chairs, a reduction in janitor work—these and similar reasons for purchase make no answer whatever to the "I'm no millionaire" argument and so utterly fail to open prospects' minds even to a consideration of the matter.

The only sales approach that has a chance of success involves, first of all, negative selling: Getting the thought of high cost definitely cleared away so that the prospect will consider a purchase; then building up such a horrifying—though truthful—picture of the dirt and work of old-fashioned heating and of the unfair burden this places on the women of the household, that a powerful motive for the purchase of gas heating will have been created.

Therefore the sales visualizer was constructed along these lines. In words and pictures, it builds up the work-and-dirt story, and also the cost of excess cleaning, redecorating and so on due to furnace dirt. It definitely establishes the fact that, all costs considered, old-fashioned heating is not cheap but expensive, that in fact it costs more than gas heat—"you are paying for gas heat; why not have it?" This is negative selling of a hard-hitting quality, but when the story is convincingly told with facts and figures, it definitely clears away the greatest obstacle to the sale of gas heat. It creates receptive prospects where no prospects existed before, and is a necessary preliminary to any effective sales drive.

The sales visualizer put this line of reasoning over so clearly and so fast that it proved to be one of the best sales documents the industry ever had, and four companies cooperated in sponsoring the production of the book: The St. Louis County Gas Company, Webster Groves, Mo.; The Laclede Gas Light Company, St. Louis; The Mississippi River Fuel Company, St. Louis; and The Surface Combustion Corporation, Toledo. A limited edition was printed to take care of the requirements of these four companies and supply copies at moderate cost to other companies that might desire them.

To secure inquiries for gas heating estimates and leads for the salesmen, a powerful direct mail campaign was employed. This began by featuring the "news" of the "New Gas" which the company had just made available—an 800 B.t.u. mixture of natural and artificial gas. Then it, like the visualizer, vigorously developed the two themes: The work and dirt of old-fashioned heat make it an intolerable burden for the women of the household, and also make it cost more than gas heat. Some of the titles used were:

"Investigate the new Low Gas Costs before you decide how to heat your house this winter."

"Gas Heating Reduced ⅓—It will pay to investigate at once."

"22 Reasons for piping your Fuel into the house."

"The Same House but what a change—Now it is Gas Heated."

"Uniform Healthful Heat without Work and without Dirt . . . You are paying for it . . . Why not have it?"

"Of course you want gas heat. You are paying for it."

"Women deserve a 'break.'"

"You don't mind spending the money. You'll clean up the winter's dirt no matter what it costs."

Similar seasonal messages were carried on ten large, illuminated bulletin boards at strategic, suburban, head-on locations. The accompanying illustration shows one of the messages that was used during the campaign.

Having broadened the market for gas heating by adjusting the rates and featuring the comparatively small investment required for a conversion burner, the company increased its mailing list from 6,500 to 17,000 to include every family appearing to have an income sufficient to warrant the purchase. This was not done haphazardly. On the contrary, the most exhaustive efforts were made to do the listing accurately so as to avoid the waste that goes with careless mailing lists, and at the same time to avoid the

(Continued on page 349)

A. G. A. Participates in Meeting of Master Plumbers

A. G. A. exhibit at Master Plumbers' Convention at New Orleans

THE National Association of Master Plumbers held its convention in New Orleans, June 19-22, at the Municipal Auditorium. One entire section of the auditorium, known as the Exhibition Hall and measuring 320 feet by 80 feet was turned over to the exhibitors.

In addition to the many fine displays of the manufacturers, the New Orleans Hot Water Service Association had a novel exhibit showing the latest types of automatic water heaters. This association was organized to promote the interests of the New Orleans water heater dealers and it cooperates in the sale of automatic water heaters with the local utility and members of the New Orleans Licensed Master Plumbers Association.

With the aid of cards and copies of newspaper advertisements, there was shown visually the merchandising and promotional methods employed by the Water Heater Dealers in cooperation with the utility and plumbers, this was demonstrated to dealers interested in such an arrangement.

The American Gas Association, New Orleans Public Service Inc. and Louisiana Power and Light Company jointly occupied four booths measuring 22 feet by 23 feet at which the latest types of domestic appliances, hotel ranges and heavy duty equipment were exhibited. The special feature which proved of much interest to the visiting delegates was a large book displaying advertisements of companies from various cities that are cooperating in the sale and installation of gas equipment.

The display space was equipped with a table and chairs—the delegates and guests were invited to sit down and discuss their problems with representatives at the booths, who outlined the policies of some of the gas companies which have adopted cooperative merchandising plans. The important part which the American Gas Association is playing in bringing about ethical merchandising practices of the utilities throughout the country was covered in detail.

President E. B. Kleine presided at

Display of cooperative advertising attracts wide attention at New Orleans meeting

the business sessions which were well attended.

Mayor T. Semmes Walmsley of New Orleans cordially welcomed the delegates and guests to the city.

Vice-President R. J. Barrett, in a few well-chosen words, responded to the Mayor's address.

President Kleine delivered a splendid address, covered the Association's accomplishments of the year and outlined many constructive activities for the association to consider in the future. He also stressed the importance of coordination of effort of the members to meet present competition.

Other prominent speakers of the plumbing industry addressed the membership.

A. B. Paterson, president of the New Orleans Association of Commerce, who is also president of New Orleans Public Service Inc., delivered an address, "Creating Demand in the Old House Market." In his remarks Mr. Paterson said he could not overlook the opportunity of congratulating the officers and members of the association for what they had already accomplished and the splendid constructive work they are now doing. He also paid tribute to the local association for its good business judgment in effecting a satisfactory plumber-dealer-utility cooperative merchandising plan, which arrangement is responsible for the harmonious relation now existing between the three groups of the industry.

Many resolutions were presented for the membership to vote upon. One affecting utility merchandising was introduced, but met with much opposition, and it was finally referred to a committee to redraft so as to embody some suggested changes. The revised resolution is to be so worded as not to affect utilities in sections where satisfactory arrangements have been consummated. The revised resolution will be submitted to the membership to act upon at the 1934 Convention.

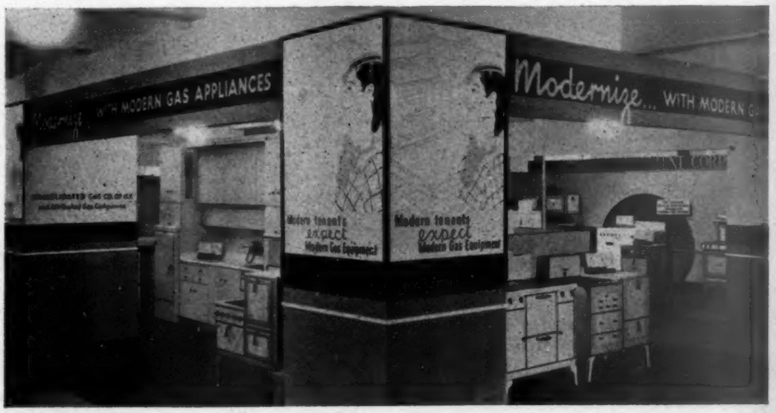
Despite the fact that attendance at the 1933 Convention was substantially smaller than it has been in previous years, the meeting was outstanding for constructive work accomplished. A national code of minimum sanitary requirements for plumbing was agreed upon by the delegates present, and this code will be presented as the standard upon which master plumbers of the country have agreed.

In addition to action on a uniform sanitary code, the convention agreed upon the form of code their branch of the plumbing and heating industries will present to the administrators of the National Industrial Recovery Act at Washington.

The convention was a success in every way, the registration including members, exhibitors and guests totaled 996; and it is estimated 8,500 visited the exposition. The visitors enjoyed the hospitality of a great southern city, and the New Orleans Association was congratulated upon the fine manner in which the convention was managed.

Following are the new officers elected for the association year ending June, 1934: Robert J. Barrett, Washington, D. C., president; John J. Calnan, Chicago, Illinois, vice-president; Frank Bentley, Washington, D. C., secretary, and H. O. Green, Tulsa, Oklahoma, treasurer.

Gas Appliances Displayed at New York Show



Glimpse of gas appliances shown at Building Modernization, Maintenance and Operation Merchandise Exposition

THE new air-cooled gas refrigerator received a great deal of attention at the exhibit of the Consolidated Gas Company of New York during the Building Modernization, Maintenance, and Operation Merchandise Exposition, held at the Lincoln Building, New York City, in June, under the auspices of the *Real Estate Magazine*.

The refrigerator was the center of attraction in a section which was devoted exclusively to modern gas equipment. The exhibit of the Consolidated Gas Company was in the center, surrounded by the exhibits of prominent manufacturers of gas appliances. Among those exhibiting were:

American Radiator Company, American Stove Company, Dahlstrom Metallic Door Company, Estate Stove Company, Insulating Products Company, Johns-Manville Company, Nu-Type Submerged Water Heater, Roberts and Mander Stove Company, J. Rose and Company and Standard Gas Equipment Corporation.

The "Kitchen Compact" was also featured in the gas section of the exposition. This is a new all-steel, unit-construction, set-up which combines all domestic fuel uses in one attractive kitchen layout. In a limited space are housed an automatic gas range, an air-cooled gas refrigerator, and standard kitchen cupboards and cabinets.

The general purpose of the gas exhibit was to show building owners and operators how they can eliminate vacancies in their apartment and commercial buildings by installing modern gas equipment.

The gas exhibit was designed and constructed under the supervision of R. M. Martin, director of display, Consolidated Gas Company.

Rubber Tires Made By Gas at Chicago Fair

By J. B. Nealey

A MODEL tire factory fabricating finished tires from the raw material, comprising the Firestone exhibit at the World's Fair, is undoubtedly the finest of its kind ever attempted anywhere. It embodies the latest contributions to this science including the gum dipping of the tire fabric, an exclusive Firestone process.

Huge bales of crude rubber, direct from the immense Firestone plantations in Liberia, Africa, are first masticated between enormous steel rolls where various chemicals are added to give it the strength, toughness, elasticity and long life that have made Firestone tires famous throughout the world. Some of these rubber sheets are used to make treads while others are rolled into the tire fabric.

The gum dipping device shows how the cotton cords or fabric, used in the tire, are impregnated with rubber and this impregnated cloth next passes through the heavy calender rolls where rubber sheets from the first rolls are pressed into it from both sides.

The treads are made by forcing the masticated rubber through the die of a tubing machine. It emerges as a long continuous body of the exact size and shape of the tire tread and it is cut into tire lengths.

The gum impregnated rubber covered cord is cut into plies, at an angle, on an automatic bias cutter. The actual building of the tire is accomplished on a drum, where the plies, tread and beads are assembled and automatically stitched together. This flat band is now expanded into tire shape by an intricate method developed by Firestone engineers. Here both pneumatic and hydraulic pressure expand the tire and push the beads together and at the same time an air bag—similar to an inner tube —is inserted.

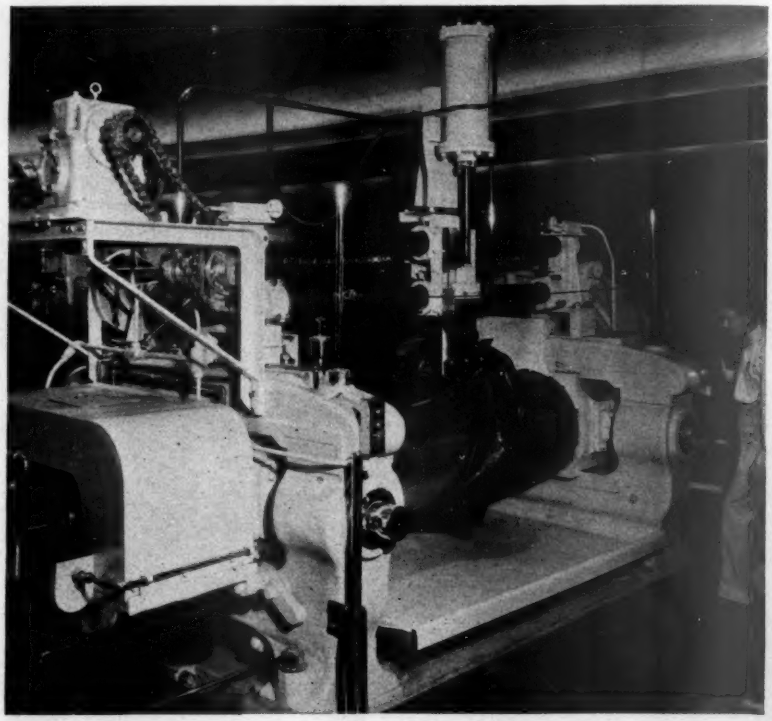
Vulcanizing

Vulcanization by an ultra modern automatic process, perfected in the Firestone laboratories, is accomplished in eight cylindrical steel molds. Each mold is provided with four services; (1) hydraulic pressure, furnished by motorized pumps; (2) steam for both pressure and heat, from a gas-fired boiler; (3) air for pressure inside the tire, supplied by a power driven compressor, and (4) water from mechanically driven pumps for cooling the molds. Finally the famous Firestone non-skid design, which is cut into the inside wall of the steel mold, is molded into the rubber of the tread.

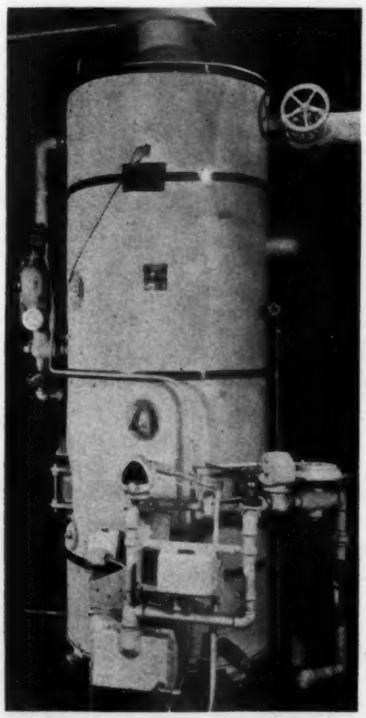
All of these services to the individual molds must be absolutely controlled as to volume, pressure and temperature and they are also provided with Firestone "timers" so as to synchronize their simultaneous functioning. The flashing of colored

lights informs the operators of the conclusion of the various steps in the process. Next in turn comes the air bag extractors; striping and medallion painting; inspection and wrapping, the latter being accomplished by machine.

Variation in steam temperature would be disastrous to the process so it was necessary to develop controls of super sensitivity to automatically maintain the steam temperature within the necessary limits of plus or minus one degree. A 27 horsepower, vertical, high pressure fire tube boiler was used and this is heated with a number of small burners, firing through refractory tunnels in a single setting. Air for combustion is furnished to the windbox by a small blower operated by a one-sixth horsepower motor. The burners are provided both with a primary gas-air mixture and secondary air at the heads. These atmospheric type burners take both the primary and secondary air from the windbox at very low pressures (from 1/4 to 1/2 inch water column) while gas is furnished at 3 1/2 inches water column by means of a low pressure regulator of the dead weight diaphragm type. The volume of air entering the fan is regulated by a louvre type shutter interconnected with the gas valve control so that the predetermined gas-air ratio is constantly maintained throughout the range of operation.



Milling



Gas-fired steam boiler, automatic and continuous in operation

The main gas line to the burner is equipped with a hand valve which is set to allow a gas flow just below the full operating demand. At the same time the fan shutter is set for the correct air-gas ratio at that rate of flow. This gas line is bypassed around the hand valve by another which is provided with a stall motor operated valve of the on and off type. This motor is connected by a lever to the fan shutter which it opens wider when the gas flow is initiated and restores it to the original setting when it closes the gas valve.

A supersensitive thermostat in the steam line makes and breaks the electric current to the motor as the steam temperature rises or falls a single degree from the control setting.

There are three different types of automatic protection to the firing system, all connecting with a motor operating a valve cut into the gas line back of the by-pass and pressure regulator. This valve is held open by a rack and pinion and against a spring. In the event of current failure this motor "goes dead" and the spring closes the valve and shuts off the gas flow. This is the first protection and the second consists in passing the same electric circuit through the pilot light, the free end of which impinges on a contact. The current flows as long as this pilot is lighted but is interrupted and the gas valve motor "goes dead" the moment the pilot goes out. The third protection is from a mercury switch cut into the same circuit with the others and actuated by steam pressure from the boiler. This protects the system against excessive steam pressure. Closer control of the steam pressure to the molds is furnished by a motor operated pump which maintains a constant circulation of steam to a loop line supplying the molds.

Other Firestone exhibits include

(Continued on page 349)

Research in Fundamentals of Combustion Space Requirements in High Temperature Gas Furnaces

PART II

INVESTIGATION OF THE COMBUSTION CHAMBER OR COMBUSTION SPACE

By E. O. Mattocks

Industrial Gas Research Engineer, American Gas Association Testing Laboratory

THE second phase of the investigation of combustion space requirements for high-temperature industrial gas furnaces involved a study of the effect of the characteristics of the combustion chamber on the nature of combustion or the burning of the gas. In most industrial furnaces, the fuel gas must be completely burned before the hot products after combustion are circulated around the work to be heated. Therefore, the determination of the amount of space necessary to completely burn a given quantity of gas is of the utmost importance in industrial furnace design. If the combustion chamber is too large, as is generally the condition, unnecessary expense is incurred in extra materials and construction costs. In addition, there is a continual heat loss through this superfluous portion of the furnace when in operation. If, on the other hand, the combustion chamber is too small, incomplete combustion of the gas is likely to result.

Although a wide variety of consumptions, ranging from 14,000 to 1,000,000 B.t.u. per hour per cubic foot of combustion space, have been published as representing the maximum amount of gas that can be successfully burned in industrial furnaces, the fundamental principles underlying the limitations on the amount of gas that can be completely burned in a given space have never been reported. Considerable work has been done, however, on several contributing factors, such as ignition velocity, ignition temperature, flame temperature, heat transfer, and the manner of combustion of some pure gases. This information was useful to some extent in helping to explain some of the results secured in the present investigation. The major problem, however, concerning which there was little or no information available, involved a determination of the range of gas inputs and furnace atmospheres, under varying conditions of temperature, pressure, combustion space, and burner design, within which the combustion of the fuel gas would be complete.

The study of all of the factors involved in this phase of the investigation is by no means complete at this time. Nevertheless, the data already secured indicates more or less definitely the nature of the final results. It is expected that at the completion of this research it will be possible to develop practical mathematical formulae which will make the proper design of combustion chambers a comparatively simple analytical problem, based on definitely proven relationships.

A. Test Apparatus and Procedure

The first combustion chamber tested was cylindrical, 2 inches in diameter by 17½ inches long, and possessed a volume of 0.0339 cubic feet. The walls were 2 inches thick. Since the temperature range encountered in this space was greater than could be successfully handled with thermocouples, the burner and combustion chamber were completely encased in a water jacket. By measuring the temperature of the water flowing in and out of this jacket and the quantity of water passing through it in a given time, the heat loss from the furnace could be determined. From this data and the heat input, the average flue gas temperature could be calculated. A pressure burner with an 11/16 inch diameter port was inserted tightly into one end of the combustion chamber while the other end was left open to serve as the flue.

A second cylindrical combustion chamber was also constructed, 3 inches in diameter by 17¼ inches long, with a volume of 0.0625 cubic feet. Like the first chamber tested, walls 2 inches thick were employed. However, this furnace was not encased in a water jacket, and a larger burner, having a 1⅛ inch diameter port, was used.

A modified Orsat type of gas analysis apparatus, constructed for the investigation of flues, was used for analyzing the flue gases. In addition, an Iodine Pentoxide apparatus was employed for more accurate determinations of carbon monoxide. It was necessary to develop a sampling tube that was capable of cooling the gas sample as it was being drawn from the furnace rapidly enough to prevent the combustion of any unburned gases. Such a water-cooled sampling tube is shown in Figure 10. In order to avoid the possibility of oxidation, a quartz rather than a metallic tube was used to conduct the flue gases. Rapid cooling of the end that was directly immersed in the hot flue gas stream was accomplished by forcing the fresh cooling water against this end of the tube first, after which it traveled the length of the tube toward the water outlet. This water-cooled sampling tube proved to be very effective in obtaining a true sample of the hot flue gas. As determined from preliminary tests, the best gas sample was obtained with the water-cooled sampling tube placed parallel to the flow of the hot flue gas and pointing into the combustion chamber.

A general view of the set-up including the two furnaces and all the other necessary equipment is seen in Figure 11. The movable refractory wall which protected the exposed cooling water and flue gas sample conduits from the high-temperature flue gas was completely removed from one furnace and partly from the other in this picture.

The use of the Iodine Pentoxide apparatus for the determination of CO in the flue gas was not introduced into the test procedure until after preliminary tests had revealed that relatively large amounts of excess O_2 were required at the higher inputs to completely eliminate all the CO and H_2. Since the Orsat type of gas analysis apparatus was unable to yield the per cent of CO plus H_2 accurately enough, the per cent of CO as obtained on the Iodine Pentoxide apparatus was used to obtain an accurate CO plus H_2 reading. From previous analyses the average ratio of CO to H_2 was found to be about 60 to 40. Therefore, by dividing the per cent of CO from the Iodine Pentoxide apparatus by 0.60, an average CO plus H_2 reading was obtained which was far more accurate than that determined by any other method. However, this procedure could only be used for percentages of CO plus H_2 less than about 0.2 per cent.

The most important factor in this phase of the investigation was the determination of the furnace atmosphere. In general, furnaces are operated in practice with a wide range of atmospheres from highly reducing (large percentages of CO and H_2) to highly oxidizing (large per-

This is the second installment of a paper by Mr. Mattocks describing some of the research recently conducted in the fundamentals of combustion space requirements in high-temperature gas furnaces. This work is being carried on at the A. G. A. Testing Laboratory, under the supervision of the Committee on Industrial Gas Research. Part I, published last month, contained observations and conclusions on the effect of flue variables.—Ed.

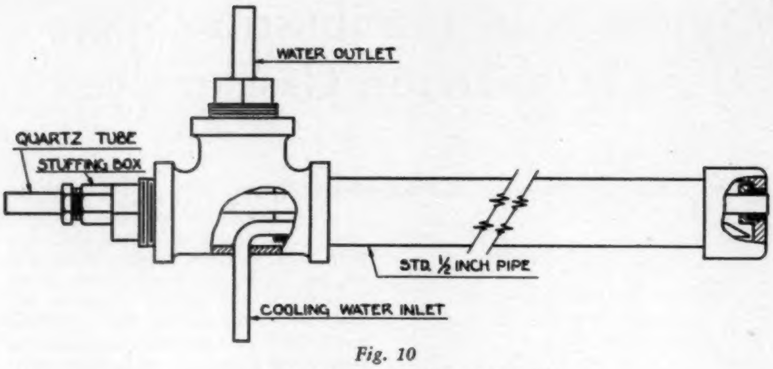


Fig. 10
A. G. A. water-cooled sampling tube

centages of O_2). However, a larger number of furnaces are operated at almost neutral atmospheres which is the point of maximum fuel efficiency. A strictly neutral furnace atmosphere is one in which the only products present after combustion are CO_2, N_2 and water vapor. In this investigation, however, atmospheres containing in addition less than 0.05 per cent of combined CO and H_2 and/or 0.05 per cent of O_2 were still considered as neutral. The allowance of this small amount of O_2 or combined CO and H_2 was continued throughout the entire range of inputs even though it extended beyond the range within which neutral atmospheres were obtained. Although it may seem peculiar, at the higher inputs, the amount of excess O_2 required to burn all but this small permissible amount of reducing products (0.05 per cent of CO plus H_2) was at least 50 per cent less than that required to burn absolutely all measurable amounts of reducing products. This was also true in the case of the amount of CO plus H_2 required to consume all but the small permissible amount (0.05 per cent) of O_2.

Because of the relatively small amount of refractory material used in the 2 test furnaces, only an hour had to be allowed for the combustion chamber to reach equilibrium conditions. A sample was then drawn through the water-cooled sampling tube into the Orsat gas analyzing apparatus and a like sample drawn into a sampling bottle for analysis in the Iodine Pentoxide apparatus. The flue gases were analyzed for CO_2, O_2, CO, H_2, and hydrocarbons. Except for that small range of inputs throughout which neutral atmosphere could be attained, test points were run either in the oxidizing region and the amount of excess O_2 increased until all but 0.05 per cent of combined CO and H_2 was completely burned; or in the reducing region, and the amount of CO plus H_2 increased until all but 0.05 per cent of O_2 was completely consumed. As soon as the desired atmospheric condition was obtained, the heat input to the furnace was measured and, in the case of the smaller furnace, the temperatures of the water in and out of the water jacket along with the quantity of water passing through that jacket in a given time were recorded.

B. Discussion of Results of Combustion Space Investigation

During this phase of the investigation, the following factors were considered:

1. The effect of the size and shape of the combustion chamber on combustion.
2. The effect of the wall thickness on combustion.
3. The effect of the furnace pressure on combustion.
4. The effect of using different types of fuel gases on combustion.

1. Effect on Combustion of the Size and Shape of the Combustion Chamber

The diameters of the two combustion chambers tested were the same as the tunnel diameters recommended by burner manufacturers for the port sizes used. With such a diameter as an initial starting size, tests were conducted throughout the range of inputs obtainable with the burner and the set-up employed. All inputs were converted to equivalent inputs in B.t.u. per hour per cubic foot of combustion space. During these tests, equivalent inputs in excess of 3,000,000 B.t.u. per hour per cubic foot of combustion space were successfully burned in the smaller combustion chamber. At this input, however, about 4 per cent excess O_2 was required to burn all but 0.05 per cent of CO plus H_2. Likewise, to consume all but 0.05 per cent of O_2 required about 4 per cent CO plus H_2. In fact these limits remained about constant from a certain minimum input (800,000 B.t.u. per hour per cubic foot of combustion space) to the maximum tested input. At no time could a neutral atmosphere be obtained between these input limits. At inputs lower than 800,000 B.t.u. per hour per cubic foot of combustion space the limits of excess O_2 or CO plus H_2 required became smaller until at inputs below 100,000 they vanished and practically neutral atmospheres could be obtained.

Although the larger combustion chamber had more internal surface, from which to radiate heat to the outside air, than did the smaller combustion chamber, the limits of excess O_2 and required CO plus H_2 were about the same as those found for the smaller combustion chamber. The input range, for the larger furnace, however, over which the 4 per cent limits remained constant under the same combustion conditions as previously specified for the smaller furnace extended from 1,000,000 B.t.u. per cubic foot of combustion space up to the maximum test input of 2,500,000 B.t.u. per hour per cubic foot of combustion space.

The general form of limiting furnace atmosphere curves is shown in Figure 12. From these curves it is seen that the possibility of securing an absolutely neutral atmosphere can only be realized at relatively small inputs, usually 100,000 B.t.u. per hour per cubic foot of combustion space or less. The symmetrical nature of the limit curves in the oxidizing and reducing regions is very interesting and somewhat unexpected. It will be noted that, for a given input, the same percentage of excess O_2 was required to burn all but 0.05 per cent of CO and H_2, as the combined CO and H_2 required to consume all but 0.05 per cent of O_2.

To further test the effect of the size of the combustion chamber, a 10-inch combustion chamber extension was constructed on the end of the larger furnace. Although this additional space increased the combustion chamber volume by 63 per cent (new volume 0.1019 cubic feet), the

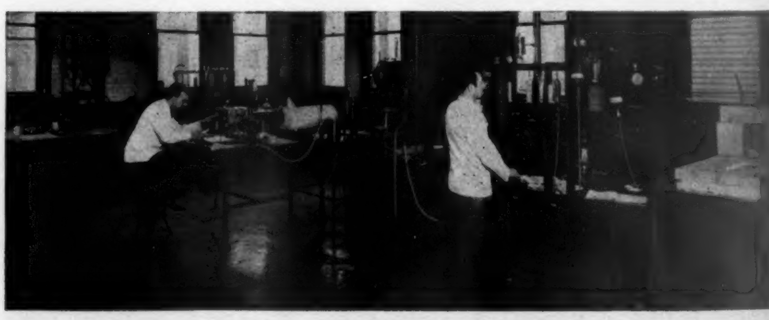


Fig. 11
View of equipment and two test furnaces used in the investigation of high-temperature combustion space characteristics

O_2 and combined CO and H_2 limits were practically the same as those obtained with the smaller furnace for the same equivalent inputs.

Additional tests will be conducted at some time in the future on a combustion chamber of different size and shape to further verify the above indication.

2. Effect on Combustion of Wall Thickness

Very little information is available at this time on the effect of the thickness of combustion space walls on the combustion of the gas. The two furnaces tested had the same wall thickness although one was equipped with a water jacket and the other was not.

The big factor associated with wall thickness is its final effect upon the internal wall temperatures and upon the final flue gas temperature. It is planned to investigate this relationship more extensively at a later date.

3. Effect on Combustion of Furnace Pressure

All tests so far discussed were conducted with the one end of the cylindrical combustion chamber fully open and discharging flue gas directly into the air without restriction. This resulted in furnace pressures of nearly zero. However, when a refractory plug, which reduced the outlet area 90 per cent, was inserted into the end of the combustion chamber, the atmospheric limits were very appreciably increased (i.e., the two curves of Figure 12 were further spread apart). The maximum static pressure encountered with this set-up was about 1 inch of water, which is rather large. However, before any definite conclusions can be drawn, on this subject, additional tests will have to be conducted. Nevertheless, these results indicate an objectionable effect of high furnace pressure upon combustion.

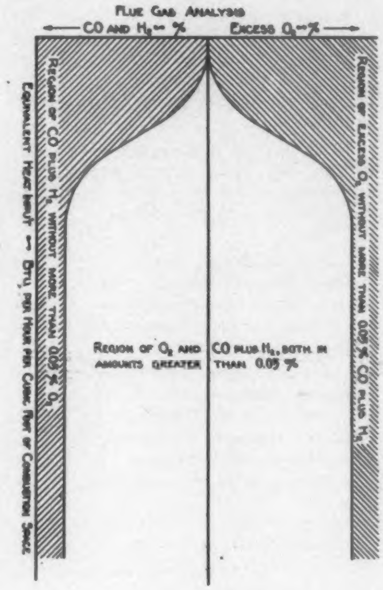


Fig. 12

General form of limiting furnace atmosphere curves

4. Effect on Combustion of Using Different Types of Fuel Gas

The first tests conducted in this investigation were with natural gas averaging 1,140 B.t.u. per cubic foot which is fairly representative of the natural gases in use. Coke oven gas with an average heating value of 545 B.t.u. per cubic foot was used for the manufactured gas tests. From the tests conducted to date, very little difference was observed in the atmospheric limits obtained with natural and coke oven gases. The results, of course, will have to be further verified and extended before definite statements can be made concerning the effect on combustion of using different fuel gases.

PART III

INVESTIGATION OF BURNERS

A study of the effects of the type of burners used on combustion space requirements constituted the third phase of this investigation. Heretofore the selection of burners for an industrial gas burner installation has been a matter decided largely on the basis of the experience of the individual designer. From the experimental work performed to date in connection with this research, it is apparent that the selection of burners for industrial gas furnaces should receive more consideration than has normally been the case in the past. Usually, the number of burners to be employed is decided chiefly on the basis of initial and operating costs as well as on the basis of heat distribution, the assumption being that the size of the burner has little effect upon combustion.

A. Test Apparatus and Procedure

The first tests conducted in the investigation of burners were made in conjunction with the investigation of flues. In addition to furnace C-1, which employed a single burner, another furnace identical in every respect to this furnace except that it employed two burners, having the same total port area as the single burner used in C-1, was built and tested. This second furnace was identified by the number C-2.

The effect of burner port size on combustion was investigated by inserting several different sizes of bushings into the original burner port. In addition, a series of tests were also made using multiple-port burners. All of these tests were conducted in conjunction with the combustion chamber tests discussed in Part II.

B. Discussion of Results of Investigation of Burners

The results of this phase of the investigation may be classified under three general headings as follows:

1. Effect of number of burners used.
2. Effect of port size.
3. Effect of type of burner employed.

These subjects will be discussed in the order mentioned.

1. Effect of Number of Burners Used

When two burners of the same total port area as the one used in furnace C-1 were tested in an identically dimensioned furnace (C-2), the effect of varying the flue condition, for the three flue conditions, was found to be practically the same as was experienced with the single burner furnace. The test data for the two-burner furnace (C-2) were plotted on the same curve sheets (Figures 4, 5, 6, 7, 8, and 9) as that for the single burner furnace (C-1). Additional tests will be necessary, however, before any definite conclusions can be drawn. The data secured as a result of varying the burner port size applies also to a limited extent to the number of burners employed.

2. Effect of Port Size

Tests to determine the effect of the port size on the limit of CO plus H_2 (or excess O_2) necessary to eliminate all but 0.05 per cent of the O_2 (or CO plus H_2) were conducted on both of the cylindrical furnaces referred to in Part II. Burners having round ports 11/16 inch and 3/8 inch in diameter, together with a multiple-port burner having 24 No. 48 ports, were used in tests on the smaller furnace. The larger furnace was tested with burners having round ports 1/2 and 1 1/8 inches in diameter. Although not complete, the results of these tests indicate very definitely that, for a given input, the smaller the port size selected the larger the amount of gas that can be completely burned. At the higher inputs, for a given rate, less CO and H_2 or excess O_2 was required with the small ports than with the larger ports. This tendency existed in tests on both combustion spaces. At some future time definite relationships will be determined concerning the effect of port size upon combustion.

3. Effect of Type of Burner Employed

Since only one type of burner was used in the tests previously discussed, the effect of using other types of burners had

to be determined. Tests conducted in connection with another A. G. A. Industrial Gas Research project known as "Research in The Elimination of Noise in Industrial Gas Burners," revealed that the burner employed in this study was extreme in producing an excessive amount of turbulence in the flame. Therefore, if a burner which produced only a minimum amount of turbulence in the flame was tested, two extreme conditions would have been investigated. This condition of minimum turbulence was secured by altering the internal contour of the burner with plaster of Paris so that the port approach offered a minimum amount of resistance and change of direction of flow to the gas stream.

Tests conducted on this modified burner showed practically no changes in combustion characteristics up to an equivalent input of 1,500,000 B.t.u. per hour per cubic foot of combustion space. A very noticeable decrease in noise produced, however, was noted. Since the types of the port streams from practically all commercial burners fall within the two extreme cases tested, it seems reasonable to assume that different types of premix burners do not differently affect combustion at the lower inputs. Plans have been made to extend this study to include tests also on nozzle-mixing burners.

Summary

This research in combustion space requirements for industrial gas furnaces is only partially completed; consequently, the data presented in this paper should, in most cases, be considered as indicative and not necessarily conclusive of the results to be expected in practice. It is believed, however, that the information secured to date will be of considerable value to those interested in the design and operation of industrial gas furnaces, and should serve as an effective guide within the limits stated. Additional information will be published in the future for the purpose of verifying and augmenting the present data.

The results obtained thus far in this investigation may be briefly summarized as follows:

1. For a given heat input, varying the size, shape, or number of flues had little effect upon the flue temperature. Generally, however, the smaller the flue opening, the higher the flue temperature.

2. For a given heat input, varying the size, shape, or number of flues had practically no effect upon the outside furnace wall or inside furnace wall temperature distribution.

3. For a given heat input, varying the size, shape, or number of flues had no apparent effect upon the amount of gas that could be completely burned. However, the tested inputs never exceeded 75,000 B.t.u. per hour per cubic foot of combustion space.

4. The "motive" pressure, which was considered as the total force causing the products after combustion to flow through the furnace and out the flue, was found to be practically independent of flue or furnace construction.

5. For a given furnace, the relationship between the "true" furnace pressure and the average hot flue gas velocity through the flue was found to be independent of the flue area.

6. A method was developed by which the total flue area required to produce any desired furnace pressure could be calculated for a given furnace, temperature, gas, heat input, and atmosphere.

7. The size of the combustion chamber, within the limits tested, did not appear to alter, materially, the amount of gas that could be completely burned per hour per cubic foot of combustion space.

8. Excessively high furnace pressures appeared to interfere materially with the combustion of the gas.

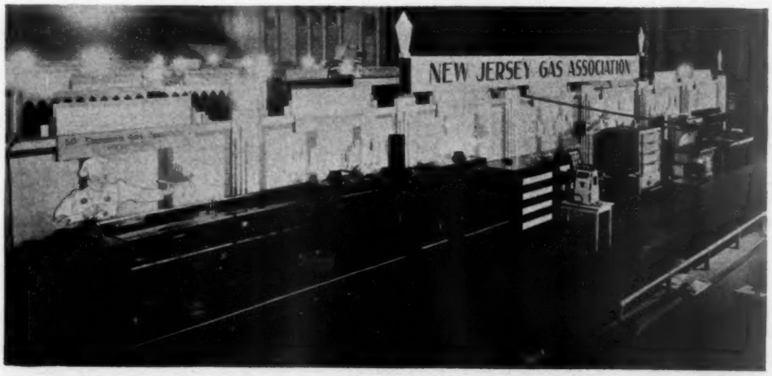
9. There appeared to be little difference between using coke oven gas and natural gas from the standpoint of the amount of heat that could be liberated per hour per cubic foot of combustion space.

10. For a given heat input (less than 75,000 B.t.u. per hour per cubic foot of combustion space), the number of burners used did not appear to exert any measurable effect upon combustion.

11. For a given heat input (more than 100,000 B.t.u. per hour per cubic foot of combustion space), the port size appeared to affect materially the combustion of the gas; the smaller the port the better the combustion.

12. For a given degree of premixing the air and gas, the type of premixing burner employed did not appear to influence the combustion of the gas at the lower inputs.

New Jersey Gas Association Sponsors Appliance Show



New Jersey Gas Association display of kitchen appliances at Hotel Meris Convention, Asbury Park, N. J.

THE largest exhibit at the recent convention of the New Jersey State Hotel Association, held at Asbury Park, May 22-27, was a display of gas-burning kitchen appliances sponsored by the New Jersey Gas Association. Seven manufacturers, all members of the association, participated in the exhibit which included many of the latest developments in ranges, bake ovens, broilers, automatic toasters, deep-fat friers and other gas-burning equipment. The appliances were effectively set off by an attractive background designed and executed by the display department of Public Service Electric and Gas Company.

It is estimated that approximately 18,000 persons attended the convention. During the four days the Gas Association's exhibit was on display, numerous leads were obtained and several sales made. Representatives of gas utility companies in the State were in constant attendance at the exhibit to help explain the advantages of gas-burning equipment to visitors.

The New Jersey State Hotel Association includes in its membership executives of most of the important hotels, clubs, and restaurants in the State. Inasmuch as manufacturers of competing fuels were planning to exhibit at this convention, executives of the New Jersey Gas Association felt that gas-burning equipment should be shown to the best possible advantage. Gas Association officials were well-pleased with the interest shown in the display by those who attended the convention.

The manufacturers who exhibited at the association's booths were: Standard Gas Equipment Corporation, Savory, Inc., Homestead Heater Company, Surface Combustion Company, Ershler-Krukin, Inc., Roberts & Mander Stove Company, Detroit and Michigan Stove Company.

Gas Fuel Is Used Throughout Popular Resort at World's Fair

Entrance to streets of Paris

ALL the atmosphere of bizarre Paris, the Mecca of world travelers for centuries, is recreated in the Streets of Paris at the Chicago World's Fair. A bit of the student quarters, the famous Montmartre on the Seine River has been faithfully reproduced on the shore of Lake Michigan to complete the illusion. Nothing has been spared in money and effect, the buildings and streets being an exact replica of the original.

There are eighteen buildings in all and these are centered about two large courts, each opening at one end directly on the water. These courts are bordered by streets onto which open shops and cafes in profusion. There are nine cafes seating from fifty to 700 with the chairs and tables partly inside and partly on the sidewalk, just as in Paris. Bars with French bar-maids are everywhere. Gayly colored tables with umbrellas occupy terraces.

Narrow streets winding in back of the various buildings are thronged with laughing, jesting night life of Paris. Here visitors rub shoulders with gigolos and their female counterparts, serious students, tired French business men, French peasants, gendarmes, French sailors and soldiers and apaches, a nondescript aggregation such as only Paris can produce. Even the street lighting is by typical Parisian street lights on short iron poles.

The famous Cafe de la Paix is the largest cafe and there is a private club for the social elect of Chicago who sponsored the Streets of Paris, and their visiting friends. The Cafe de la Paix extends along one side and one end of the first court, Terrace du Lido, with outdoor terraces for tables, fronts on the water. In the center of this cafe is a large space for the well-known American bar, and this space, walls, ceiling and floor, is painted black which is relieved by a series of dramatic masks in colors.

The walls of the East Room are marbelized as in the original and the walls of the West Room are covered with murals depicting scenes in French life. In the court is a raised stage for floor shows which consist of French stage favorites that have appeared in the Follies Bergeres and equally well-known Parisian theatres, night clubs, etc. Apache dances are also featured.

Corner in kitchen of Café de la Paix

In front of the stage is a swimming pool for the exhibition of former Olympic diving champions who appear four times daily. In addition there is a large dance floor and orchestra.

The other court is somewhat similar to the first but offers a greater variety of Parisian sights, scenes and smells. A taxi dance floor and orchestra occupies the center while all around the bordering streets are shops selling paintings, flowers, perfumes, jewelry, lace, lingerie, etc. Such signs as Auberge de Bourgogne, Le Comptoir des Parfums, Noveautes Parisienes, etc., abound. In between these are various cafes bearing the names of the originals, such as Cafe de la Rotonde, Cafe "le Select," Cafe du Dome, Moulin Rouge, Cafe des Chauffeurs and Cafe du Lapin Agile (leaping rabbit). Some of these are typical Apache hangouts with red checked table cloths, sawdust on floor, etc. Typical French dishes and cuisine is served throughout.

All the cafes are served from one kitchen which is behind the Cafe de la Paix. This has the latest modern equipment for quick and efficient service including several hotel gas ranges, steam tables, mechanical dishwashers gas heated, refrigerators, warming ovens, gas coffee urns and an automatically controlled gas-fired water heater. Gas is the fuel used throughout as it is in every other restaurant at the World's Fair.

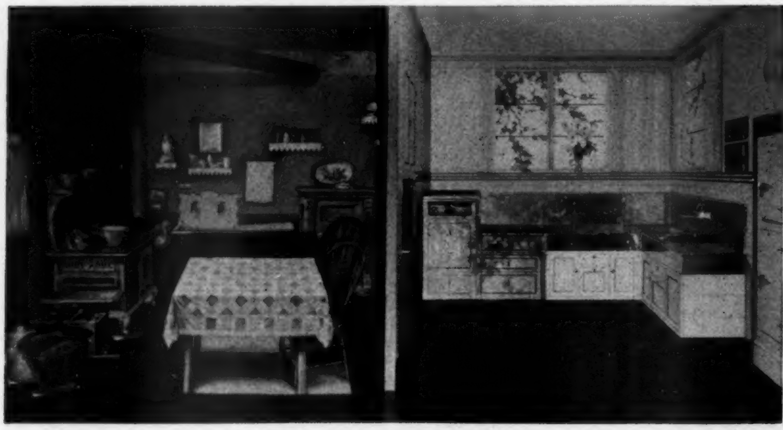
The entrance to the Streets of Paris resembles the side of a ship with gangplank, rows of ship windows, smoke stacks, life boats, etc., and a steamer whistle blows at intervals.

One establishment is completely equipped with the best known gambling devices including the inevitable roulette wheel. Here one can sit in on any kind of game he or she chooses.

If you cannot visit European Paris this Summer, do not feel disappointed for the gay part of it is lifted bodily and transported to the Century of Progress for your delectation. By simply walking up the gangplank one instantly enters the gay atmosphere of a happy festival in full progress.

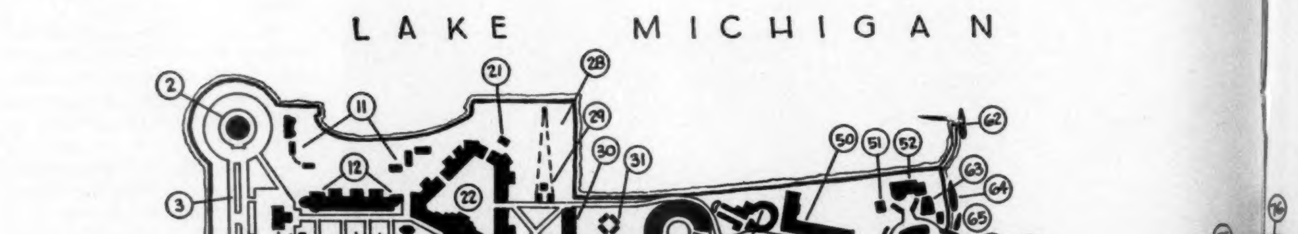
Sidewalk cafes in streets of Paris

Additional Views of Gas Industry Exhibit



The old kitchen versus the new

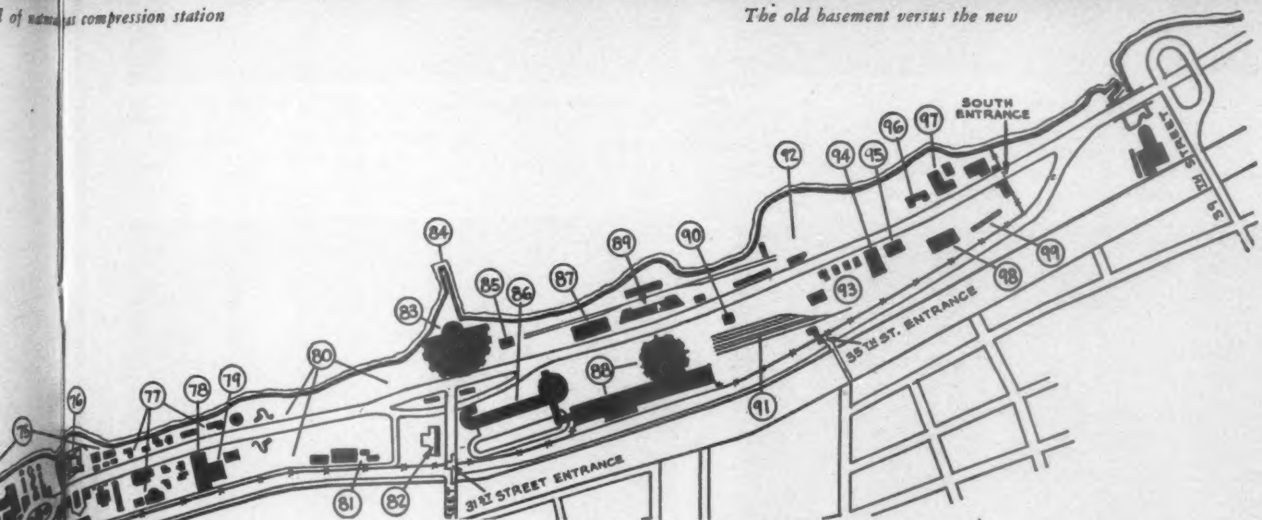
Enlarged scale model of



it a Chicago and Key to Exposition Buildings

l of na as compression station

The old basement versus the new



Adler Planetarium.................. 2
Administration Building........... 10
Air Show, Inc...................... 87
Alaskan Cabin...................... 21
Alpine Garden...................... 74
A & P Carnival..................... 70
Aquatic Golf..................E of 30
Avenue of Flags.................... 16
Belgian Village.................... 73
Bluenose 65
Boy Scout Exhibit.............S of 21
Byrd's Ship........................ 54
Casino de Alex................N of 87
Century Beach...................... 11
Century of Progress Club........... 53
Chapel Car....................W of 36
Chinese Pavilion................... 38
Chinese Theatre.................... 38
Christian Science Monitor Bldg. 45
Chrysler Motors Building........... 86
Columbus Memorial Light............ 32
Czechoslovakian Pavilion........... 24
Dairy Building..................... 9
Days of '49........................ 94
Domestic Animal Show............... 95
Edison Memorial Building........... 33
Egyptian Temple.................... 51
Eitel's Rotisserie................. 5
Electrical Building................ 40
Enchanted Island................... 43
Field Museum....................... 6
Firestone Building................. 59
Florida Gardens.................... 13
Foods and Agricultural Building 12
Fort Dearborn...................... 76
Garden of Comfort.................. 57

GAS INDUSTRY HALL.................. 79
General Cigar Company Exhibit. 69
General Exhibits Group............. 46
General Motors Building............ 83
Goodyear Field..................... 92
Grand Stand........................ 15
Great Beyond....................... 96
Greyhound Service Station.......... 98
Hall of Religion................... 49
Hall of Science.................... 35
Hall of Social Science............. 30
Havoline Thermometer............... 56
Hollywood 52
Home and Industrial Arts Group 77
Home Planning Hall................. 78
Horticultural Building............. 50
101 Ranch..........................101
The Hub—Henry C. Lytton & Sons 61
Illinois Host House................ 19
Indian Village..................... 81
Infant Incubator................... 67
Italian Pavilion................... 26
Italian Restaurant................. 27
Japanese Pavilion.................. 37
Lama Temple........................ 36
Machinery Demonstration Area.. 91
Maya Temple........................ 82
Mexican Village....................100
Midway 75
Miller High Life Fish Bar.......... 18
Moroccan Village................... 72
Muller Pabst Restaurant............ 47
Norwegian Ship..................... 64
Old Heidelberg Inn................. 71
Outdoor Railway Exhibit............ 91
Pabst Blue Ribbon Casino........... 53

Palwaukee Amphibian Ramp.... 85
Picnic Grounds..................... 28
Planetarium Bridges................ 4
Poultry Show....................... 93
Radio & Communications Bldg.. 31
Rapid Transit Terminal............. 8
Receiving Depot.................... 99
Rolleo (Log Rolling)...............102
Schlitz Garden Restaurant.......... 25
Science Bridge..................... 34
Sears, Roebuck Building............ 14
Shedd Aquarium..................... 1
Show Boat.......................... 44
Sinclair Prehistoric Exhibit....... 58
Sky-Ride 29
Soldier Field...................... 17
Solomon's Temple................... 11
Spoor's Spectaculum................ 63
States Building.................... 22
Streets of Paris................... 68
Submarine S-49................E of 26
Swedish Pavilion................... 20
Terrazzo Promenade................. 3
31st Street Boat Landing........... 84
Time & Fortune Building............ 41
Travel & Transport Building.... 88
23rd Street Bridge................. 66
23rd Street Steamer Landing.... 62
Ukrainian Pavilion................. 97
U. S. Army Camp.................... 80
U. S. Government Building.......... 23
Whiting Corp. & Nash Motor Bldg. 90
Walgreen's Store................... 60
Wings of A Century................. 89
World A Million Years Ago.......... 55

Century of Progress in Kitchens Told In Miniatures by American Stove Co. at World's Fair

A colonial kitchen, 1833

An 1860 kitchen when housewives talked of Lincoln and slavery

In 1888 women began to enjoy the luxury of gas cooking

The year 1903 saw the growth of gas for cooking

1920 found gas used universally for cooking

The ultra-modern kitchen of 1933
—Designed for American Stove Co., By McMillen, Inc.

Affiliated Association Activities

Pacific Coast Gas Association

THE annual Northwest Conference of the Pacific Coast Gas Association, program of which was outlined in THE MONTHLY, in June, was attended by more than 100 gas company executives and department heads from companies in Oregon, Washington and British Columbia, as well as representatives of many appliance manufacturers.

The meetings were noteworthy because of excellent attendance and the interesting and instructive discussions which followed every item on the program. Great interest was shown in the program of the National Directing Committee of Executives as described by F. S. Wade, a member of the committee. The Conference passed a resolution of sympathy and support to this program and instructed A. E. Higgins, secretary of the Natural Gas Department of the American Gas Association, who was present, to convey this resolution to the proper authorities.

The meeting closed with a banquet and dance at the Olympic Hotel. A feature of the banquet was an address on the National Industrial Recovery Act by Worrall Wilson, chairman of the board of the Seattle Trust Company and a director of the Chamber of Commerce of the United States. Another interesting feature of the entertainment program was a revue of several acts presented by employees of the Seattle Gas Company in a most professional manner.

Those who attended the meeting were particularly impressed with the many unique load building plans developed by the Seattle Gas Company among which are an optional therm rate, a budget plan which has been instrumental in developing the heating load, and a successful club luncheon plan conducted by Mrs. Beatrice Strege, home service director for the company. Mrs. Strege serves three luncheons a week in the company's auditorium to women's clubs, and her programs and luncheons have become so popular that she is booked ahead for nearly a year.

Convention Calendar

September

11-16 American Chemical Society
Chicago, Ill.

13-15 Pacific Coast Gas Association
Ambassador Hotel, Los Angeles, Calif.

18-19 Canadian Gas Association
Ottawa, Ontario

18-20 American Transit Association
Stevens Hotel, Chicago, Ill.

25-29 International Gas Conference and Fifteenth Annual Convention, American Gas Association
Stevens Hotel, Chicago, Ill.

25-27 British Commercial Gas Association
Bournemouth, England

October

10-13 National Association of Railroad & Utilities Commissioners
Cincinnati, Ohio

24-26 American Petroleum Institute
Chicago, Ill.

Michigan Gas Association

WALTER E. WHITE, assistant chief engineer of the Commonwealth & Southern Corporation, Jackson, was elected president of the Michigan Gas Association at the annual meeting held in Grand Rapids, June 23. Other officers elected were as follows: Dan W. Hayes, district agent, The Detroit Edison Company, Port Huron, vice-president; Albert G. Schroeder, Grand Rapids Light Company, secretary.

The day before the annual meeting of the Gas Association, a joint meeting was held with the Michigan Electric Light Association, at which time there was a general discussion of utility merchandising principles. J. E. Spindle, retiring president of the Gas Association, led a discussion of the problems connected with the unauthorized use of gas and electricity.

Addressing the assembled members of the Gas Association, he emphasized the fact that the public always "will find the gas industry alert, faithful, diligent, efficient and progressing in serving them to the utmost of their needs and demands."

H. W. Hartman, of New York, assistant manager, represented the American Gas Association, and extended greetings to the Michigan Association from the national organization.

Dan W. Hayes, chairman of the Technical and Fellowship Committee, submitted a report stating that the enlarged program of research at the University of Michigan, which began in 1927, had been discontinued this year on account of the lack of funds, but added that the original fellowship, established in 1901, had been continued and recommended that there be no interruption this year. Professor Alfred H. White, who has been in charge of the fellowship work since its inception, described its operation.

French Visitors Grateful for Reception Here

ALBERT ALLEAUME and B. de Comminges, who recently made a study of the petroleum and gas industries in the United States on behalf of the French Gas Association, have returned to Paris. In a letter of appreciation to Arthur Hewitt, president of the American Gas Association, they stated: "The delightful visit we payed to you in Toronto was but a small acknowledgment of our gratitude for the help that was given us by the whole staff of the A. G. A. and by the gas people of the United States."

J. Charles Jordan Passes Away in California Home

J. CHARLES JORDAN, assistant advertising manager, Pacific Gas and Electric Company, San Francisco, died at his home in San Leandro last month, following a brief illness. He was forty-five years old.

E. C. Jones, Veteran Engineer, Dies at Palo Alto

EDWARD C. JONES, one of the three surviving members of "The Old Guard" of the gas industry, died suddenly July 22 at his home in Palo Alto, California. Frederic Egner, of Washington, D. C., and Walton Clark, of Philadelphia, are the remaining members of "The Old Guard."

Mr. Jones was born in South Boston, Mass., February 8, 1861, and entered the employ of the South Boston Gas Light Company on July 5, 1876. He became superintendent of the North End Station and assistant engineer of the company. In 1891, he went to San Francisco, where he entered the employ of the San Francisco Gas Light Company as assistant engineer. He was chief engineer of the San Francisco Gas and Electric Company; chief engineer, gas department, California Central Gas and Electric Corporation, and finally chief engineer, gas department, Pacific Gas and Electric Company. He held that position until 1920, when he retired.

ACCOUNTING SECTION

J. M. ROBERTS, Chairman H. W. HARTMAN, Secretary E. B. NUTT, Vice-Chairman

Public Relations and the Depression

By R. F. Bonsall

Sponsored by Customers' Relations Committee

REPORTS and statistics—as well as actual experience—indicate that as the various phases of a depression, such as unemployment, wage reductions and strict economies, are manifested, those departments of a public utility engaged in public relations work, find themselves taxed to a greater extent than ever before and with a real problem on their hands. Not their lot to mark time or let down, it is their job to take stock, strengthen the weak spots and prepare themselves to meet the situation.

Your meter reader will tell you of people who formerly took little notice of his coming or going, who are now on the alert when he calls, some going to the cellar to watch his reading of the meter and quite often telling him they take readings themselves between his visits, to check consumption from time to time.

Bills are checked more carefully than ever before and comparisons are made with the previous month, often resulting in a phone call or a visit to the office for a detailed explanation.

Estimates for repairs to an appliance are questioned as to the necessity and cost before the order is signed and, if the buying of a new one is recommended for economic reasons, the customer must be convinced the old one has outlived its usefulness.

In operating matters where customer's consent is necessary to renew service or extend mains, he is more reluctant to grant the desired permission until he has investigated to see for himself that it will not affect the rental or sale of his property or that the work to be done will not involve him in future expense.

You may say that these precautions have always been taken by some people. True, but by the minority rather than the majority as is now the case. Some have been forced to it by circumstances and others have drifted into it on account of the general economic trend and atmosphere. Not since the days when our grandmothers saved "drippings" for soap making and left over scraps of calico for carpets and quilts has there been such a movement for economy and thrift in the home.

In addition to the suspicions and watchfulness of the public and the general temper of the times, there are other influences to be considered. Times like these do not permit of our carrying on good will campaigns, such as the general inspection of appliances, expensive advertising, etc. In the absence of these and a number of other methods, which for the sake of economy have been abandoned in many companies, we must work just that much harder with available means to satisfy complaints and retain good feeling.

It may be said that today the public has a "pocket book nerve." This condition best illustrates itself in the cry that rates should come down; that bills are too high. While the industry has always had to deal with complaints of this nature, today the public demands more than a routine and perfunctory answer. In order to satisfy complaints, it is necessary to develop and explain in detail the various complex factors which go to make up a rate; to suggest manners and methods by which the size of the bills may be reduced. To do this, the enthusiasm and aggressiveness of the contact employees must be measureably greater than ever before. They must possess patience, tact and understanding to a high degree in order to successfully retain the friendship of the public, which is beset by worries and financial problems greater than many have ever experienced.

What is the program of the utilities in dealing with a public in this frame of mind? Shall we intensify our collection efforts or is it better to be more lenient with those customers who, in the past, have paid their obligations promptly, but who now expect a reasonable extension of time in which to meet their bills?

It is of little benefit to the utility to turn off the gas meter where the present inability to pay the service charges is due to a reduced income. The good will of the delinquent customer is materially impaired, if not lost, by doing so. The shut-off meter does not offer an incentive to pay past due bills. One company in the industry has adopted the practice of spreading over a long period of time the payment of overdue bills. This is done by removing the delinquent item from the service statement and billing a fixed amount of the accrued charges each month with the current bill. This practice has two important advantages; first, the customer feels he has been given a fresh start and consequently appreciates the company helping him when he needs help the most. Second, the utility has a satisfied customer and not a dissatisfied debtor.

What should be done regarding petitions for rate reductions growing out of such conditions? This problem can best be solved by publicly demonstrating that the utility is mindful of conditions and is willing to lend its aid in relieving them. Much was gained by those utility companies who frankly recognized that the banking holidays of a few months ago were a source of annoyance and inconvenience to their customers. Their acknowledgment of the inability of the public to pay their gas bills during the crisis by extending due dates and withholding the discontinuing of service did much to promote good will.

The average citizen is not conscious of the fact that while gas rates have not followed in the same ratio the downward trend of commodity prices in general, likewise they did not rise in the same ratio as the cost of living during the pre-depression days. These facts presented frankly, and in a spirit of friendliness and cooperation, will go a long way in demonstrating that the company is just as anxious to keep the cost of its commodity at a minimum, as the public is to have it done, and that the utility only expects a fair return on the property devoted to public use.

What then is the solution as far as public relations work is concerned? The realization that this branch of the utility's work must receive greater attention than ever before, because no company can afford to permit its investment made in working to obtain the good will of its customers over a period of years to become lost. Good will like credit, once lost is doubly hard to regain.

The training of employees must be continued and the increased necessity for tact, courtesy and patience, as well as a deep appreciation of the job in hand, emphasized. The public mood is such that evidence of sympathetic interest in their problems, exhibited by the contact employee, will gain many friends for the utility.

Public relations departments have an excellent opportunity to truly function during the depression, as the "Customer's Representative" or "The People's Counsel," if they are sensitive to their obligation.

Situated within a few yards of each other in Gas Industry Hall at the Chicago World's Fair are two exhibits dramatizing the diversified character of modern automatic gas service. In one, gas fuel converts water into ice. In the other, gas makes a huge thermometer shoot to 3000° F.

COMMERCIAL SECTION

WALTER C. BECKJORD, Chairman — J. W. WEST, Jr., Secretary — N. T. SELLMAN, Vice-Chairman

Does the Gas Industry Want the Domestic Kitchen Load?*

By A. V. S. Lindsley

The Connecticut Light & Power Co.

THE loss of domestic gas business during the past several years has again forcefully reminded us that the domestic business not only is far more important than that of any other class, but that it must either be more fully developed or else permitted to slide away. The latter, of course, would be fatal to the industry and is unthinkable.

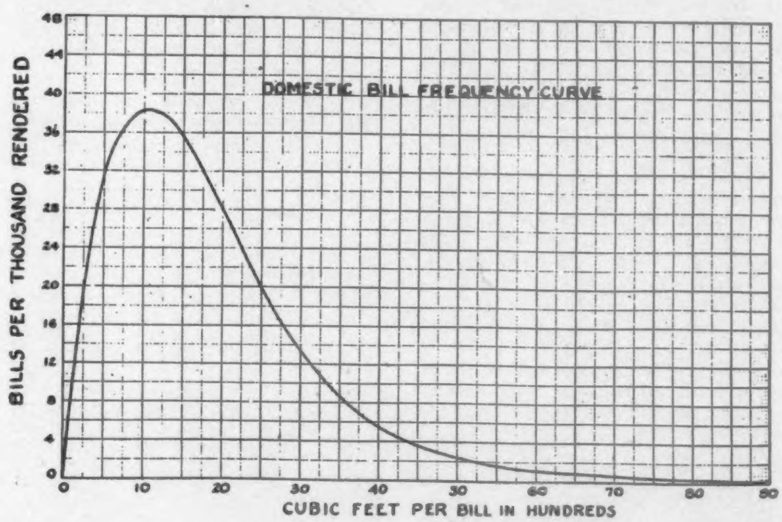
Our present position at the crossroads would appear to be the natural result of the mistake which the industry has made from time immemorial in its complacent attitude toward a division of the domestic kitchen fuel business between gas and its competitors. It is unnecessary to point out the comparative impossibility of securing an adequate return from the domestic business when it is so divided and the very marked improvement in that return which will follow the correction of that condition.

The division of the domestic kitchen fuel business in New England and the small proportion of that market that is supplied by the gas industry is evident from a Domestic Market Analysis of what might be called a typical New England company, at least a company with domestic sales approximating the average for New England. While this analysis may not be a representation for other companies, it is believed that substitution of correct individual company figures will not materially alter the findings.

This analysis clearly shows that by far the largest potential domestic load is that for kitchen fuel, namely, cooking, water heating, and space heating, and the other important domestic market for refrigeration, house heating, air conditioning, laundry drying, and incineration—these being of sufficient importance for individual treatment.

It has taken the severe economic conditions of the past few years to make us fully conscious of our unsatisfactory competitive position for the domestic fuel business. While the competition of the electric range and the oil range burner cannot be lightly passed by, the competition from the coal range has been and is today still the real hurdle that must be overcome in order to make real improvement of the position of the gas industry in the kitchen fuel supply market.

The analysis of the so-called typical New England company indicates that of a potential kitchen fuel market of 80,800 cu.ft., per residence only 25,400 cu.ft., or 31 per cent, has been secured by the New England gas industry. It is interesting to see from what sources is derived the present volume of business and from what sources the very large amount of undeveloped business is to be secured.



DOMESTIC MARKET ANALYSIS

	Prospective Users Per 1,000 Customers	*Present Sales Per 1,000 Customers*	*Potential Sales Per 1,000 Customers*	*Undeveloped Market Per 1,000 Customers*
Kitchen Fuel	1,000	25,400 M Cu.Ft.	80,800 M Cu.Ft.	55,400 M Cu.Ft.
Refrigeration	200	50	4,000	3,950
House Heating	50	500	20,000	19,500
Incineration	50	100	2,000	1,900
Laundry Drying	100	50	1,500	1,450
Total		26,100 M Cu.Ft.	108,300 M Cu.Ft.	82,200 M Cu.Ft.

A study of Domestic Bill Frequency and an analysis of customer usage indicate respectively our present unsatisfactory competitive position in the homes of the large majority of our customers and the market that has been so long undeveloped. The Bill Frequency for the typical New England company is herewith shown, both in curve and tabular form, and included with the latter is the percentage of domestic sales in each bracket.

DOMESTIC BILL FREQUENCY TABULATION

	Per Cent of Bills	*Per Cent of Cu.Ft. Sales*
Bills less than 1,000 cu.ft.	29.5%	9.3%
1,000-2,000 cu.ft.	34.8	26.0
2,000-3,000 cu.ft.	19.6	24.1
3,000-4,000 cu.ft.	8.5	14.6
Over 4,000 cu.ft.	7.6	26.0
	100.0	100.0

* Paper read before Joint New York-New England Regional Gas Sales Conference, New London, Conn., June 23, 1933.

A field survey of customers' use disclosed a startlingly large number of homes in which it was necessary to burn fuel for space heating purposes and that the fuel used was largely coal and to a growing extent oil used in a conversion burner. The burning of such fuel for space heating has resulted in the gas industry being denied even the fuel for cooking and water heating except to the extent of some summer use and a small amount of convenience cooking use at other times. Thus the industry has been and will continue to be denied the all-year-round cooking and water heating load unless and until satisfactory ways are found to supply the space heating fuel of the kitchen. Among this large group of customers lies the greatest potential domestic market in New England, and that market is available to the gas industry if proper steps are taken to develop it.

The survey indicated a division of customers into the following three groups:

Group One, the 10 per cent of the domestic customers who do all cooking with gas and who, through the means of automatic gas water heaters, do all water heating with gas and who have space heating supplied from a central heating plant. This small group of customers averages 68,000 cu.ft. of gas a year, and so far as kitchen fuel is concerned are fully developed for the gas industry.

Group Two, the 25 per cent of the domestic customers who do all cooking with gas and heat the kitchens from a central heating plant, but who divide the water heating fuel or else are in the market for an improved hot water service that can be economically supplied through an automatic gas water heater. The average consumption of this group is 38,000 cu.ft. It is estimated that this group of one-fourth of the domestic customers are each potential customers for 24,000 cu.ft. additional for water heating.

Group Three, the large majority of the domestic customers, approximately 65 per cent, who find it necessary to burn solid or liquid fuels in the kitchen for space heating and, when so doing, utilize it for some or all of the water heating and cooking during the heating months. The low average of 14,000 cu.ft. per year for this group indicates the small proportion of the business secured by the gas industry and the enormous opportunity awaiting the proper development of this market.

The summary of the present and prospective business from these three groups on the basis of 1,000 customers clearly indicates wherein lies our largest and most profitable market for the domestic business.

While this enormous kitchen fuel load should and can be secured for the New England gas industry, its development, after long neglect, will not be a simple matter. It will require the best combined efforts of the appliance manufacturers to design proper equipment, of the utility executives to study and adopt rates that will earn the business at a profit, and of the selling organization to unceasingly carry to its domestic customers the advantages and economy of gas fuel. There is, however, much in the gas industry's favor in undertaking a large development of this kitchen space heating load.

First, it is within the economics of the industry to earn the business against the present competition. While data is incomplete, it appears that the kitchen fuel bill, where coal or oil is used for space heating and all or part of the cooking or water heating, is from $75 to $85 per year. This service in the average home could be furnished by approximately 90,000 cu.ft. of gas, provided a suitable space heater were available. When the devisor of three times the present domestic sales is furnished by the addition of this class of business, the necessary competitive price level for gas is readily available.

Second, a desire of domestic customers for a better and more convenient fuel has been made evident by the enormous sales of oil range burners.

Third, the superiority of gas over other and less refined fuels and the indicated increase in price level of such fuels will materially aid proper efforts upon the part of the gas industry.

Efforts have been made in the past few years to develop the kitchen space heating, but it is apparent that the equipment now available does not meet the requirements for widespread use. While there is a limited field for some of the equipment now on the market, it would appear essential that really adequate equipment be made available at the earliest possible time. In New England alone there would appear to be a market for from one-half to three-quarters of a million of such heaters, and this market should offer an incentive for the earnest interest and cooperation of the appliance manufacturers.

The development of this business should ultimately be accomplished by displacing the old fuel range and the antiquated auxiliary gas range by a modern gas range with an efficient space heater built into the range; a range that will sell for the reasonable price required to meet the purse of its purchasing group. While such equipment must be developed for ultimate use, it would appear necessary in developing a large volume of this kitchen fuel market to have for immediate use a separate gas heating unit which is specially designed for kitchen use and having the following characteristics:

(a) High operating efficiency.

(b) Low initial cost.

(Continued on page 349)

Group 1

	Present Sales Per Customer	*Potential Sales Per Customer*	*Undeveloped Market Per Customer*
Cooking	30 M Cu.Ft.	30 M Cu.Ft.	—
Water Heating	38	38	—
Kitchen Heating	—	—	—
	68 M Cu.Ft.	68 M Cu.Ft.	None

Group 2

	Present Sales Per Customer	*Potential Sales Per Customer*	*Undeveloped Market Per Customer*
Cooking	25 M Cu.Ft.	25 M Cu.Ft.	—
Water Heating	13	37	24 M Cu.Ft.
Kitchen Heating	—	—	—
	38 M Cu.Ft.	62 M Cu.Ft.	24 M Cu.Ft.

Group 3

	Present Sales Per Customer	*Potential Sales Per Customer*	*Undeveloped Market Per Customer*
Cooking	8 M Cu.Ft.	25 M Cu.Ft.	17 M Cu.Ft.
Water Heating	6	20	14
Kitchen Heating	—	45	45
	14 M Cu.Ft.	90 M Cu.Ft.	76 M Cu.Ft.

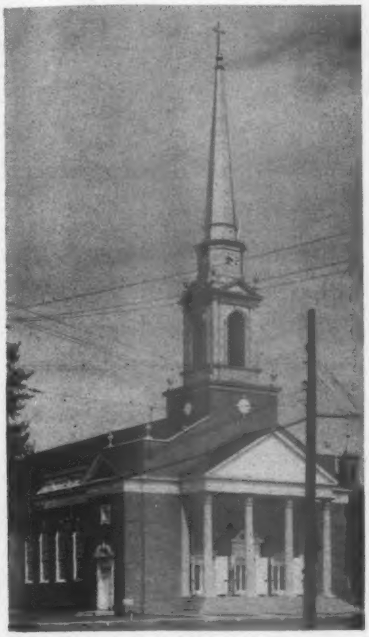
Summary

	Present Sales M Cu.Ft.	*Potential Market M Cu.Ft.*	*Amount Awaiting Development M Cu.Ft.*
Group 1— 100 Customers @ 68 M Cu.Ft.	6,800	6,800	—
Group 2— 250 Customers @ 38 M Cu.Ft.	9,500	15,500	6,000
Group 3— 650 Customers @ 14 M Cu.Ft.	9,100	58,500	49,400
1,000	25,400	80,800	55,400

INDUSTRIAL GAS SECTION

E. L. WILDER, Chairman | C. W. BERGHORN, Secretary | F. B. JONES, Vice-Chairman

Church Kitchens



First M. E. Church, Indiana, Pa., where gas kitchen has been installed.

By C. H. French*

THERE have been installed in churches during the past few years some very complete and modern kitchens. The equipment being used is comparable to that usually installed in a small restaurant or tea room, but in most cases, of better quality and finish.

Complete equipment is usually installed, including insulated restaurant type gas ranges with oven heat controls, salamanders, large broilers, toasters, deep fat fryers, coffee urns, steam tables, plate warmer serving tables, refrigerators, dish-washing machines, storage water heaters and other miscellaneous items for work necessary in a large kitchen.

The installation shown herewith is typical of many installations which have been made and which are contemplated.

There are architects who specialize in new church construction and advocate the putting in of these specially arranged kitchens. Old churches are being remodelled and re-arranged so as to make room for a kitchen if they have none, or in some instances where they have a kitchen, they are adding to it and replacing old equipment with the new modern designs.

It is surprising what a satisfactory revenue these church kitchens produce for the gas company and it is business worthwhile going after.

Church kitchens are used for many purposes, among them being special luncheons and suppers given by various committees of the church—the young ladies' clubs and young men's clubs, gymnasium classes, bowling clubs, and societies of the church. When church suppers are given, the profits go to some fund to renovate the property, make additions to it or for other special needs.

Outside clubs, lodges and societies rent the kitchen and dining room and thus additional revenue is made by the church, and indirectly the gas company benefits.

Where a church has not a kitchen or one that is only partially equipped, they should be approached in the matter of being up-to-date, and shown the advantages and benefits of a proper kitchen installation.

Where a church is located in a business district, if a tasty luncheon could be prepared and served each day to business people, a considerable revenue could be obtained through this method.

Considerable money is being spent in making these kitchens complete, not only for the appliances themselves, but in the quality of material of which they are made. In many cases, the gas ranges are constructed of bright lustre stainless steel and the other equipment made to harmonize.

Particularly at this time of the year, efforts should be made to secure this class of business, and especially so where any renovating or remodelling is necessary.

Modern gas kitchen of the First M. E. Church, Indiana, Pa.

* Member Hotel and Restaurant Committee, Industrial Gas Section, American Gas Association.

A. G. A. Member in Race for Governor

Fred W. McWane, head of the Lynchburg or home office of the McWane Cast Iron Pipe Company, has been nominated by the Republican party convention as their candidate for Governor of Virginia in the November election. The McWane pipe company has for years been a valued manufacturer company member of the American Gas Association.

Supplementary Industrial Gas Bibliography

Important new articles on the use of heat in industrial work are reported in the magazines listed below:

GENERAL DATA—A

Furnace Design A-V

Steel .... Determining the transmission of heat in industrial furnaces .... April 24, 1933 p. 23; May 8, 1933 p. 23
(Over-all coefficients obtained for actual operating furnaces. Preheating raises the coefficient.)

Miscellaneous A-XIV

Gas Age-Record .. Switch heaters eliminate ice and snow troubles .... March 18, 1933 p. 285
(Installation in the Howard Street yard of the Chicago Rapid Transit Company.)

Industrial Gas .. Gas equipment for industrial processes .... June 1933 p. 21
(Reference tabulation of gas equipment for industrial work.)

HEAT TREATMENT OF FERROUS METALS—B

Forging B-I

Gas World (London) ... Fighting depression at Newcastle-on-Tyne .... Jan. 21, 1933 p. 8 Ind. Sup.
(Reheating furnace for rolling mill changed from producer to city gas, 500 B.t.u. Economy 1.5 cu.ft./lb.—60,300 cu.ft. gas equal one ton (U. S.) coal. Batch furnace on heavy forgings 5' x 1' sq. 11,100 cu.ft. 500 B.t.u. gas equal 1 ton (U. S.) coal.)

Gas World (London) ... Recent developments in the industrial uses of gas. Industrial Gas Supplement ..... April 15, 1933 p. 7
(Forging turbine blades. 19% reduction in gas consumption during working period by using raw gas for atmosphere control. 1 gal. oil equiv. to 142 cu.ft. 500 B.t.u. gas.)

Iron Age ...... Manufacture and heat treatment of twist drills ...... March 30, 1933 p. 509
(Special time temperature cycles for this type of steel.)

Annealing B-III

Industrial Gas .. Recent car bottom furnace installations .... July 1933 p. 10
(Gas consumed for annealing steel castings in large and small furnaces.)

Cyanide Hardening B-VI

Metal Progress .. Heat treating gears in cyanide pot and drawing oven .... Jan. 1933 p. 13
(Pots heated by natural gas luminous flame.)

Miscellaneous B-XI

Heat Treating & Forging ..... Diffusion flame combustion .. Dec. 1932 p. 701
(Results on forging, annealing and normalizing furnaces, a furnace for copper ingots and a hot mill billet heating furnace.)

Iron Age ...... Manufacturing safety razor blades .... May 25, 1933 p. 811
(Heat treating operations are continuous in the modern plant.)

Transactions A. S. S. T. ... Some molybdenum high speed steels .... March 1933 p. 193-232
(Heat treating time temperature cycles.)

METAL MELTING—D

Lead Melting D-V

Gas World (London) ... Recent developments in the industrial uses of gas. Industrial Gas Supplement .. April 15, 1933 p. 9
(1 gal. oil equivalent to 40,000 B.t.u. of gas for lead melting.)

Miscellaneous D-XII

Gas World (London) ... Fighting depression at Newcastle-on-Tyne .... Jan. 21, 1933 p. 8 Ind. Sup.
(Results of melting tests on crucible and rotary furnaces. Gun metal, aluminum, brass, copper.)

Steel .... Improving open hearth furnace design .... May 8, 1933 p. 32
(Consumption of producer, mixed, coke oven gases and oil per ton ingots produced.)

INDUSTRIAL STEAM APPLICATIONS—E

American Gas Association Monthly .... Application of gas fuel to coal-fired boilers .... April 1933 p. 158
(Ratings, efficiencies obtained and combustion space requirements for converted boilers.)

Gas Age-Record .. Natural gas proves efficient in the beet sugar industry.... March 11, 1933 p. 249
(Importance of automatic regulation of drafts and gas flow.)

Industrial Gas .. More mileage on rejuvenated tires .... March 1933 p. 7
(Steam from gas-fired boiler supplies heat required to vulcanize new treads on old, worn down tires.)

Industrial Gas .. Fuel efficiency in the beet sugar industry .... April 1933 p. 17
(Importance of draft control and gas pressure control.)

WHOLESALE BAKING—F

Bread F-I

Industrial & Engineering Chemistry ... Heat flow through bakery products .... April 1933 p. 248
(Time-temperature relationships existing during the baking of bread.)

Miscellaneous F-IV

Industrial Gas .. Baking the famous "FFV" cakes and crackers .... Aug. 1931 p. 19
(Two coal reel ovens converted to gas and one gas traveling oven used.)

FOOD PRODUCTS—G

Miscellaneous G-VI

Western Gas...Gas for dehydrator fuel builds summer sales curve ....May 1933 p. 12
(Tunnel type and stack type dryers for fruit operated with indirect heaters. Change to direct circulation of flue products promises some economy.)

LOW-TEMPERATURE BAKING AND DRYING—I

Core Baking I-I

Foundry ......Controlling properties of cores. April 1933 p. 18
(Variation of core quality with sand fineness, baking time and temperature, rate of gas evolution.)

Industrial Gas..The application of convection heating by recirculation ...June 1933 p. 9
(Recirculating gas heaters have efficiency advantage over oil-fired heaters.)

Paint Drying I-IV

Gas World (London) ...Recent developments in the industrial uses of gas. Ind. Gas Supplement ....April 15, 1933 p. 10
(Lacquer drying at 250° F. Steam heat replaced by gas heat. 0.366 cu.ft. 500 B.t.u. gas per pound of stampings dried.)

CERAMICS—J

Vitreous Enameling J-III

Journal American Ceramic Society ....The blistering of cast iron. Progress Report II ....June 1933 p. 277
(Oxygen from air atmosphere causes carbon dioxide and blistering. Irons low in silicon and high in combined carbon are prone to blister.)

Ceramics J-V

American Gas Association Monthly ....Determination of the effect on wall tile glazes of direct-firing with gas ....April 1933 p. 131
(Conclusions from laboratory and field test of direct firing on colored tile.)

Terra Cotta, Sewer Tile, Refractories J-VI

Journal American Ceramic Society ....Conversion of periodic kilns from coal firing to natural gas for firing glazed clay products ....March 1933 p. 141
(By elimination of muffle and adoption of "pressure" firing not over 50% of the B.t.u. consumed in a coal-fired muffle will be required in a corresponding direct gas-fired kiln.)

Miscellaneous J-VII

Brick Clay Record ....Firing a continuous kiln with natural gas ....April 1933 p. 135
(18 chamber kiln converted from oil to gas. Advantages of gas are given.)

Brooklyn Poly Plans New Course in Industrial Gas Engineering

FOR six years the Polytechnic Institute of Brooklyn has been giving an evening course in gas engineering consisting of twenty-six lectures and twenty-two laboratory sessions, with an accompanying series of conferences, plant visits and quizes. The purpose of this work is to offer to the man taking it a general survey of the field of gas engineering, in order to create in him a better understanding of his job and its relationship to that of his fellow-workers, and his value as a unit in a complex organization rendering a public service. This course was initiated largely through the efforts of Clifford E. Paige, vice-president of The Brooklyn Union Gas Company, and as a result of the continued guidance and cooperation of gas company officials in the metropolitan district more than 230 men have received its training since its inception.

Requests have come from time to time for more advanced work in industrial gas engineering and the Polytechnic has, therefore, prepared a special course for the coming year dealing with this subject. It will consist of fifteen, three-hour laboratory sessions, given one each week, probably on Wednesday evenings from 6:30 to 9:30 starting September 27 or October 4. This special course, like the established course in gas engineering, has been planned with the cooperation of industrial gas engineers who have had wide experience in the application of gas to industrial heating.

It is recognized that the fundamental theories and principles involved in industrial gas utilization may be obtained from textbooks, technical papers and correspondence courses. However, it is believed that the new applications of gas and the great field of future applications can best be studied by actual laboratory demonstration of the fundamentals involved. Many industries base their general design work on the results of laboratory experiments carried out on a small scale. This can also be effectively accomplished in the case of gas-fired equipment, resulting in the elimination of much of the experimental work which is so often done after installation of full size equipment. The advantages to be thus gained are obvious. Several of the experiments of this course are planned especially to demonstrate the possibility and methods of carrying on experimental work with inexpensive equipment.

The laboratory work is divided into three parts:

Part 1—Covers the characteristic properties of burner equipment with special emphasis on the relation between flame characteristics as influenced by burner orifice—port ratios of atmospheric and high pressure burners.

Part 2—Covers the determination of combustion chamber requirements and flue sizes together with their correct location for maximum heat utilization and best temperature distribution.

Part 3—Consists of a study of properties of materials such as refractories and insulators which are used in the construction of industrial heating equipment. Also, effects of various kinds of atmospheres on such materials and on metals.

In connection with the laboratory work, the class will be required to make a critical study of the experimental data and, when needed, to draw sketches, plot curves and write analytical reports of their findings. Home work will be assigned to lay out hypothetical installations and make recommendations of suitable gas-fired equipment together with a fuel cost analysis of the proposal.

The Polytechnic Institute possesses an exceptional assortment of gas furnaces and

(Continued on page 349)

NATURAL GAS DEPARTMENT

GEORGE W. RATCLIFFE, Chairman — A. E. HIGGINS, Secretary — FRANK L. CHASE, Vice-Chairman

John B. Tonkin Is Elected Head of Peoples Natural

John B. Tonkin

JOHN B. TONKIN, since 1918 vice-president and general manager of the Peoples Natural Gas Company, Pittsburgh, Pa., has been elected president of the company and its affiliate the Columbia Natural Gas Company. He succeeds Christy Payne who was recently elected vice-president and treasurer of the Standard Oil Company of New Jersey.

Mr. Tonkin's election to the presidency climaxes a career of thirty-nine years with the organization and its associated companies. He is widely known throughout the natural gas industry, being actively associated with the American Gas Association, past president and director of the Pennsylvania Natural Gas Men's Association, a director of the Peoples-Pittsburgh Trust Company and the Passavant Hospital of Pittsburgh.

He is also president of the Lycoming Natural Gas Corporation.

Leaving the United States Naval academy in 1894, Mr. Tonkin entered the gas industry as a clerk in the pipe line department. He was later transferred to the purchasing department, and after a series of promotions became treasurer of the Hope Natural Gas Company in 1902. He continued in that position until 1918, when he was elected vice-president and general manager of the Peoples Natural Gas Company.

Mr. Tonkin is a native of Tidioute, Pa., the son of the late Captain John Tonkin.

J. French Robinson has been named vice-president of the Peoples Natural Gas Company, succeeding Mr. Tonkin. He has been with the company since 1920 as geologist and engineer. Since 1930, he has also been manager of the Lycoming Producing Corporation, with headquarters at Wellsboro, Pa.

Mr. Robinson is a graduate of West Virginia University and served as assistant geologist of the Baltimore and Ohio Railroad. Prior to his association with the Peoples Natural Gas Company, Mr. Robinson was assistant geologist for the State of Pennsylvania.

South Wind Starts Well Flow

A natural gas well which flows only when the wind is blowing from the south was brought in a short time ago at Goodrich, Texas. It is described in a news dispatch as "one of the most freakish wells known to the industry." The hole, barely forty feet deep, yields a large volume of gas when the wind is from the south. The flow stops entirely when the wind blows from the north.

Plans Mixed Gas for Minneapolis

THE Minneapolis Gas Light Co., Minneapolis, Minn., has notified the Minneapolis City Council that it will be able to supply natural gas or a mixture of manufactured and natural gas to its customers beginning October 1, at a price considerably less than the present rate for manufactured gas.

Officers of the company said that natural gas will reach Minneapolis from Texas by the Northern Natural Gas Co., whose pipe line reaches as far north as Owatonna, Minn., sixty miles south of Minneapolis.

Chemists Meet

THE Regional Sub-Committee of the Chemical Committee, Technical Section, American Gas Association, held a meeting in the General Office Building of The Brooklyn Union Gas Company, Brooklyn, N. Y., on June 27. There were about sixty chemists and engineers present from all the gas companies in the Metropolitan area of Greater New York.

The following papers were read and discussed:

"An Investigation of the Nitric Oxide Content of Works Gas," by V. Porrazzo.

"A Study of the Effects of Humidity in Gas Calorimetry," by F. R. Fahey.

"The Application of Flue Gas Analyses to Industrial Problems," by M. Berman.

E. C. Uhlig, chief chemist of The Brooklyn Union Gas Company, acted as chairman.

Dresser Buys Bryant Heater

THE "Bryant Pup," which everybody has seen in the advertising pages of the national magazines, has a new owner in S. R. Dresser Mfg. Co., which bought The Bryant Heater & Mfg. Co. on June 15. S. R. Dresser Mfg. Co. has been identified with the gas industry for fifty years through its manufacture and supply of pipe couplings, clamps, and other pipe line accessories.

PUBLICITY AND ADVERTISING SECTION

JAY C. BARNES, Chairman ALLYN B. TUNIS, Secretary HENRY OBERMEYER, Vice-Chairman

Lone Star Gas System Again Wins First Place in Ad Contest

FOR the third consecutive year, the Lone Star Gas System, with headquarters in Dallas, Texas, has won first prize in a national advertising copy contest among the major gas companies of the country.

The Public Utilities Advertising Association, which conducts the "Better Copy Contest," at its annual meeting in Grand Rapids, Mich., announced that an ad entitled "Natural Gas Is Your Lowest Priced Domestic Servant," had been judged the best piece of copy among all advertising placed in newspapers by gas companies of the United States in the year 1932.

The prize winning ad appeared in more than 200 Texas and Oklahoma newspapers in February last year. Copy was prepared by Willard G. Wiegel, assistant advertising manager of the Lone Star Gas System which includes the Community Natural, Municipal, Texas Cities, Stamford and Western, Dallas and Lone Star gas companies. Will C. Grant is manager of the advertising department. This company also won first prize last year in the same contest with an ad written by Mr. Wiegel and received first honors also in 1931.

The nation's best gas advertisement was a simple, direct statement of how much gas service a penny would buy. It stated that one cent's worth of natural gas service would cook a good dinner for three people, operate a bathroom heater for two hours, heat enough water for two baths, operate a living room heater for forty-five minutes, make thirty-three cups of coffee, heat enough water for fourteen shaves or run a gas refrigerator for eight hours.

The Consolidated Gas Company of New York, captured second place in the gas newspaper advertising division of the "Better Copy Contest," while the Pittsfield Coal Gas Company, Pittsfield, Mass., received honorable mention.

In the gas window display division, awards were made as follows:

Kings County Lighting Company, Brooklyn, N. Y., first prize; Consolidated Gas Company of New York, second prize; Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y., honorable mention.

Fifteen of the twenty-four awards made were for utility newspaper advertisements. This covered the field of gas, electricity and street railways.

E. Frank Gardiner, Midland United Company, Chicago, was re-elected president. Other officers are:

First vice-president, Henry Overmeyer, Consolidated Gas Company of New York; second vice-president, J. R. Pershall, Public Service Company of Northern Illinois, Chicago; third vice-president, Donald D. Perry, Central Hudson Gas & Electric Corporation, Poughkeepsie, N. Y.; secretary, Eric W. Swift, Commonwealth Edison Company, Chicago; treasurer, Howard F. Weeks, Consolidated Gas Company of New York.

New directors are William Culver, Commonwealth Edison Company; A. G. Whidden, Arkansas Power & Light Company, Pine Bluff; and E. K. Hartzell, Lake Shore Electric Railway Company, Sandusky, Ohio.

Among the speakers at the association's sessions were John R. Marsh, advertising manager, Georgia Power Company, Atlanta; William G. Woolfolk, president, Detroit City Gas Company; Helen Rockey, assistant manager, advertising bureau, Consolidated Gas Company of New York, and vice-president, A. F. A.; Ivan Page, Western Newspaper Union; Leonard Dreyfuss, president, United Advertising Corporation, New York; Wesley A. Gilman, vice-president, N. W. Ayer & Son, and Morris E. Jacobs, vice-president, Bozell & Jacobs, Omaha, Neb.

Mr. Marsh outlined some of the problems confronting the advertising manager of a state-wide utility, while Mr. Woolfolk pointed out the necessity for advertising to develop a personality for each company, and urged that advertising be looked upon as "in some respects as much of an investment as our mains and generating equipment."

Miss Rockey pointed out that after a long period in which the cost of service was constantly lowered and made available for many purposes, the current of public opinion has again swung back to a primary consideration of rates. She asserted that the job facing the utilities now is to sell appreciation of utility service to the consumer, and to create a realization of the unusual value which public utilities are now delivering.

Mr. Dreyfuss asserted that the American Telephone & Telegraph Company is a fine illustration of what can be accomplished by the proper use of advertising. He declared: "The utilities, in my judgment, have a similar job to do. Almost every utility has a sizeable appropriation for advertising. Few of the utilities are allowing this money to work for them to the fullest measure.

"Many dissipate almost their entire advertising appropriation in stereotyped ads to advertise gadgets of one kind or another when of paramount importance is the building of good will within the community the utility serves."

Rochester Gas Holder Monument of Good Will

WHEN the large 6,000,000 cu.ft. capacity gas holder was planned for Rochester, N. Y., some years ago, there was much disturbance among residents of the East Side where it was to be erected. The late Robert M. Searle, for many years president of the Rochester Gas and Electric Corporation, at that time listened to a delegation of citizens who came to tell him their objections. Then, he arranged a general meeting for all to attend. He told these citizens that if the holder were built, he would see that it was not painted red but a serene, battleship gray, that he would build on the site of the tank a park with tennis courts, ball diamonds and picnic grounds and that the property would always be maintained in such a manner as to be an asset to the locality. Mr. Searle kept his word. Years have passed by and Searle Park, as citizens have come to call the Blossom Road gas holder property, is maintaining its popularity not only with residents in its vicinity but with citizens of the whole city. Searle Park has become a Mecca for athletics, church picnics and neighborhood gatherings as well as other functions. There is always a waiting list for the tennis courts and baseball diamonds. Since Mr. Searle's death, the Rochester company has carried out the letter of his promise. The grounds are well-kept and the huge holder is always neatly painted. It stands as a monument of good will.

TECHNICAL SECTION

J. A. PERRY, Chairman H. W. HARTMAN, Secretary O. S. HAGERMAN, Vice-Chairman

The Recirculated Oil Gas Process

By E. S. Pettyjohn

Research Engineer, University of Michigan

THE introduction of natural gas into manufactured gas territories has necessitated the development of a process for meeting peak loads and failures of supply. In a majority of these areas, carburetted water-gas machines have been shut down and, if a suitable method can be found, are available for making a high-heating-value substitute gas in these emergencies. The recirculated oil-gas process has been proposed as this method.

Oil gas is not new in that it has been produced on the Pacific Coast for many years. In this period the major difficulty accompanying this production has been the successful elimination or utilization of lamp black formed during cracking. Two methods have been followed, namely to recover the lamp black as a by-product or to deposit the lamp black in a refractory filter and convert it either into fuel or into water gas. In the former case, a satisfactory market for this troublesome by-product has been only partially developed after several years of intensive effort. In the latter case, the conversion of part of the lamp black into water gas has resulted in the addition of a low-heating-value rapid-burning diluent. This dilution has so increased the rate of flame propagation as to make the substitution of this final product for undiluted natural gas, unfeasible.

In the application of the Pacific Coast oil gas processes to the production of a high-heating-value oil gas as a substitute for natural gas, this difficulty of the proper disposition of the lamp black formed has again been presented. The development of a suitable market for lamp black in former manufactured gas territories has appeared impractical. The conversion of the lamp black into fuel and water gas has been accepted as the only suitable outlet. This conversion can be accomplished provided all of the lamp black is accumulated in the proper location in the water-gas set and is a solution for this problem provided the diluent gas formed does not eliminate the finished product as a substitute for natural gas.

The above methods for the disposal of lamp black have been predicated on the necessity of its formation in oil cracking. Research on the cracking and stability of hydro-carbons at elevated temperatures presents numerous examples in which cracking is accompanied by carbon deposition. This deposition can be avoided, however, by reductions in temperature and by accurate control of the time of contact. Under these conditions, methane is the most stable hydro-carbon and as it is also the largest constituent in natural gas, the oil gas produced may be substituted for natural gas.

Outline of the Recirculated Oil Gas Process

The Recirculated Oil Gas Process was designed to provide both the necessary control of time of contact and of temperature to produce a gas of high methane content without the formation of lamp black. The oil to be cracked is atomized into the top of the carburetor through a standard type oil spray. The atomized particles are vaporized and partially cracked as they are carried rapidly forward by steam superheated in the checkerbricks which have been substituted for the fuel bed in the generator to increase the available heat storage capacity. As this mixture reaches the base of the carburetor part of it is withdrawn through an auxiliary line and recirculated through the generator and carburetor increasing the velocity of the atomized oil particles through these high-temperature zones. The remainder of the partially cracked oil vapor passes upward through the superheater at a rate which allows a longer time of contact in this lower temperature zone. By varying both the portion of the oil run during which the partially cracked oil gas is recirculated, and the quantity recirculated through changing the volume of steam admitted to the aspirator, the quality of the finished gas may be controlled.

The tar that is formed is separated from the gas stream in the usual manner and is returned to the generator through a bustle pipe and burners to provide the heat for oil cracking. Any excess above the quantity necessary for warming up the machine and for combustion during the blast may be returned to the generator through a spray in the charging cover. In this manner, the single by-product of the process is eliminated.

In water gas plants which have been partially abandoned, the generation of steam may be extremely costly and impracticable. When this condition obtains, the recirculation may be accomplished by compressing and admitting a small quantity of the finished gas to the aspirator. As no water gas is made, the only process steam required is for purging the set and it is believed that this purging can be safely accomplished with water sprays.

High-pressure air is a more satisfactory tar atomizing medium than steam, and with water for purging and when motor driven blowers and exhausters are used, steam generating equipment is not essential.

Operated without a fuel bed, without steam other than that generated within the machine, without either lamp black or tar as by-products, the recirculated oil gas process offers distinct possibilities as an economical method for converting abandoned carburetted water-gas sets into stand-by equipment for meeting peak loads and failures of supply in natural gas territories.

Initial Test of the Recirculated Oil Gas Process

To determine the efficiency of the process, a test was conducted in a town which had been recently converted to natural gas. It was necessary to alter the standard equipment of the 10-foot water-gas machine used for test purposes.

Modification of Standard Equipment

GENERATOR: An arch was sprung in the generator above the clinker doors supported on a false side wall and a central pier and nineteen courses of 2½" spaced checkerbrick were placed on this arch. Four of the clinker doors were bricked in with 3" tunnels into which were inserted three tar burners and a natural gas burner. The fifth clinker door was reserved for inspection purposes. A 1" bustle pipe was installed below the clinker doors to supply tar to the burners and a ¾" bustle pipe was placed alongside the 1" bustle pipe to supply steam or air for atomization. The charging throat was bricked in to protect the charging cover from overheating. A sight cap for inspection of the checker work and a spray for back-run tar were attached to the generator charging cover.

CARBURETOR: A 12" recirculated gas line fitted with an hydraulically operated gate valve was led from the inspection door at the base of the carburetor to the ash pit door on the left-hand side of the generator. In this pipe at the base of the generator was placed a 2" steam nozzle which was used to aspirate the partially cracked oil gas from the base of the carburetor and force it to pass upward through the generator. The carburetor oil spray was enlarged to provide an admission rate of 60 gallons per minute.

SUPERHEATER: No alteration.

AUXILIARY EQUIPMENT: Tar meters were connected into the feed lines to the tar bustle pipe and to the generator charging cover and the necessary hydraulic operating valves were installed and connected to the valve nest on the automatic control. This control was equipped with seven cams. The hydraulic piping was connected in the fol-

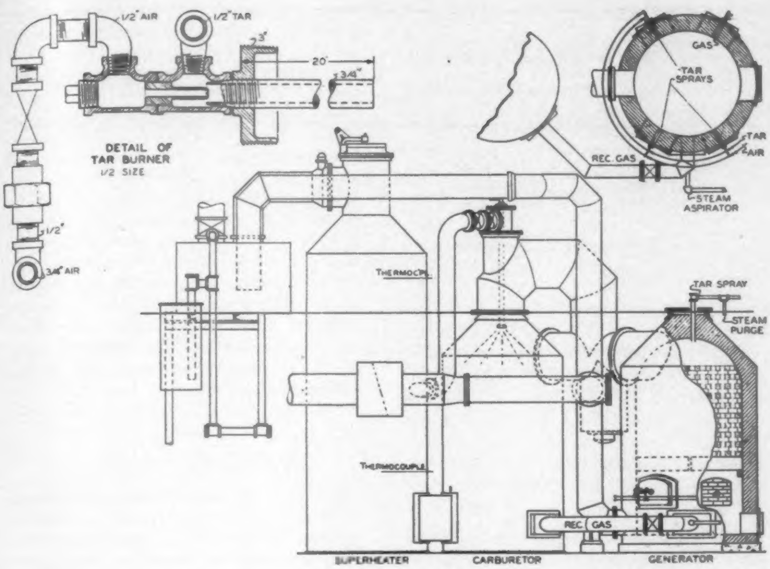


Plate 1

lowing manner: (1) Blower; (2) Tar and air to tar burners; (3) Carburetor air; (4) Stack and generator air; (5) Main steam supply; (6) Oil admission and steam to aspirator in recirculated oil gas line; (7) Back-run and generator tar.

This distribution was made to provide for an emergency shutdown of the equipment. The details of the installation and final design of the tar burners are shown in Plate 1.

Description of Test

During the test, Mid-Continent Gas Oil was used in the carburetor and 4 per cent moisture content water-gas tar was used in the generator. The oil was pumped from storage into a supply tank, the rate of flow through the meter and oil spray being controlled by air pressure.

The tar for the burners and the backrun was pumped from storage into the deemulsifier to provide a suitable reservoir and forced with low-pressure steam through the meter to the bustle pipe and the burners.

Air was used for atomizing the tar in the burners during the majority of the runs. This air was supplied at about 90 lbs. pressure by a gasoline-motor-driven air compressor.

The recirculated gas was made directly into a 300,000 ft. two-lift station holder. The gas was then drawn through a washer cooler into the exhauster and forced through the tar extractor, purifiers, and Connersville rotary displacement meter, the calorific value being determined continuously with the aid of a Thomas calorimeter. Snap samples were taken at frequent intervals for analyses and for specific gravity determinations. During the latter part of the test, two gas ranges were set up in the meter room and were adiusted for natural gas. The combustion characteristics of the recirculated gas were determined by using these appliances at frequent intervals during the day without further adjustment to either orifices or air shutters.

Test Procedure

In starting up, natural gas was lighted with the aid of a torch saturated in oil and allowed to burn until the arch blocks in front of the burner were at a dull red heat. The air compressor was then started and a small amount of air and tar were admitted to the burner adjacent to the gas burner, ignition again being obtained by inserting the touch through the inspection hole in the fifth clinker door. When the tar was lighted and the inspection port closed, the blower was started and a small amount of air admitted through the generator blast line and the natural gas burner shut off. After 10 minutes these quantities were gradually and simultaneously increased until 2½ gallons of tar and 5,000 cu.ft. of air were being admitted per minute. These amounts were continued for 15 or 20 minutes when the second tar burner was lighted and an additional quantity of generator air supplied. The third burner was then lighted and the carburetor blast valve opened as soon as the carburetor could be lighted.

The preliminary warming-up period occupied about 30 minutes and the secondary period, after all the burners and the carburetor were lighted, usually required an additional 30 minutes. Before going onto an oil run a steam run was made by hand with the stack open to insure that all of the valves were operating properly and to cool the generator checkerwork. The machine was then ready for gas making.

During the latter part of the test, on the days in which the machine was operated consecutively, the gas burner was lighted, the inspection port closed, the generator air turned on and tar admitted to the burner adjacent to the natural gas burner. The heat stored in the checkerbrick with the flame from the natural gas burner was sufficient to ignite and sustain combustion of the tar and to make it possible to light off the other burners at a decreased time interval.

Outline of Test

The test was divided into three periods of less than one week each. The first period was used in starting up the machine. No data were obtained and no calculations were made of the efficiency of the process. The second period was used to modify and rebuild the special test equipment to eliminate the lamp black which was present in the gas at the start of the make, the result of tar seepage through the burners. The tar burners were successfully rebuilt and during the third period satisfactory results were obtained. Averages of these results, with the operating cycle and conditions are presented in the table on the next page.

These results are only indicative of the efficiency of the process. The fuel consumption was higher than anticipated, partially due to the inclusion of the heating-up tar with the burner tar. With continuous operation this quantity would not be necessary and would result in a proportional saving. The oil required is also slightly higher than anticipated, but it is believed that this quantity could be reduced to less than 10 gallons per M cu.ft. when additional experience has been had.

The make per hour, as expressed in cubic feet of equivalent 530 B.t.u. gas, is slightly higher than the average obtained with 10 ft. water-gas machines. The actual make of 1,100 B.t.u. gas is below the estimated capacity of the machine. This estimate was based on a total blasting rate of 18,000 cu.ft./min. which was not obtained under test conditions. It is believed that by lengthening the blasting period a larger amount of heat can be efficiently stored in the machine so as to increase the hourly capacity and at the same time reduce the heating value to approximately 1,000 B.t.u. with a gas of the required combustion characteristics

The analysis of the finished gas was controlled by the operating conditions. Analyses of the gas produced with and without back-run tar are given below:

TABLE B

Gas Analysis

	With Back-run Tar	*Without Back-run Tar*
CO_2	2.6	3.4
Ill.	24.2	30.0
O_2	0.4	0.8
CO	2.8	2.0
H_2	31.0	26.0
CH_4	33.8	36.8
N_2	5.2	1.0
Observed heat value	1030	1100
Observed specific gravity	0.726	0.738

TABLE A

OPERATING CYCLE AND CONDITIONS

	Seconds	
Operating cycle	91.2	Generator air = 7,000 cu.ft./min.
Steam purge	7.2	Carburetor air = 5,000 cu.ft./min.
Uprun	36.0	Tar to burners = 8 to 9 gal./min.
Recirculated uprun	57.6	Oil to carburetor = 45-50 gal./min.
Up purge	48.0	Uprun steam = 25 lbs./min.
Total cycle	240.0	Purge steam = 25 lbs./min.

OPERATING RESULTS

Quantities/M Cu.Ft.		*Gas Makes*	*Cu.Ft.*
Carburetor oil, gals.	10.80	Per run	= 5,835
Burner tar	2.69	Per hour	= 85,900
Total burner tar and carburetor oil	13.49	Sq.ft. grate area	= 1,780
Steam, lbs.	10.6	Equivalent make per hr. (530 B.t.u.)	= 178,100

OPERATING TEMPERATURES

Bottom of superheater	1,450° F.	Top of superheater	1,475° F.

The heat value per cubic foot was obtained with a Thomas calorimeter and the specific gravity with a density balance. Hydrogen and carbon monoxide, the rapid-burning constituents in the gas, increased from 28 to 33.8 per cent with the addition of back-run tar but this increase was not detrimental. The gas made under both operating conditions was burned at repeated intervals in the two test gas ranges without difficulty. Unfortunately, the test was terminated before sufficient quantities of recirculated oil-gas were distributed to definitely establish the effect of this dilution or substitution upon all types of appliances under continuous service conditions but no increase in the number of complaints was had during the period of the test.

CONCLUSIONS

From these results it may be seen that the recirculated oil-gas process may be used to produce a high heating-value gas which may be mixed with and substituted for natural gas in appreciable quantities for short periods of time. The upper limit was not determined, but it is believable that complete substitution is possible.

Eleven-hundred B.t.u. gas was made with less than 11 gallons of oil per M cu.ft. It is believed that this quantity can be reduced with additional operating experience provided the by-product tar is used for under-firing the machine.

All of the tar produced by the process may be returned to the generator as either heating-up tar, burner tar, or back-run tar. There are no other by-products or waste products. The process was operated with less than 11 pounds of steam per M cu.ft. of gas made. It is believed that this quantity can be reduced, if not eliminated, by generating the process steam within the machine.

Sufficient capacity was obtained during the test to provide against peak loads and even complete failures of supply, and it is believed that this capacity can be increased with further experience.

The modifications to the standard three-shell water-gas machine are both easily and inexpensively made and can be installed or withdrawn in a reasonable length of time. The process can be operated with a minimum quantity of labor as with automatic control and hydraulic operation one gas maker per shift is sufficient.

The essentials for successful operation in addition to carefully controlled recirculation are: (1) A tar burner which will give complete combustion and which will not seep during the make period; (2) The maintenance of temperatures in the superheater within the range of plus or minus 25° above or below 1,475° F.

The results obtained in this initial test are distinctly favorable and indicate that the Recirculated Oil-Gas Process does provide a suitable method for the utilization of abandoned carburetted water-gas equipment in the production of a high-heating-value oil-gas as a substitute for natural gas during peak loads and during failures of supply.

BOOK REVIEW

Industrial Chemistry—By William Thornton Read, Dean of the School of Chemistry, Rutgers University, published by John Wiley & Sons, Inc.

NEARLY 600 pages and 27 chapters including a very complete index are excellently described in the preface by Dean Read who says "the purpose of this book is to give an adequate and well-balanced picture of modern industries from the standpoint of chemical compounds and changes, chemical engineering operations, sources of raw materials, uses of products, and economic relationships."

This the author has done in full measure and turning first to that part about which we think we know the most we find that Chapter 24 dealing with coal products adequately discusses the fundamentals of gas manufacture including suitable references to producer gas and complete gasification as well as a brief review of low temperature carbonization.

The author explains how every chapter has been submitted to authorities in the respective fields and that in the revision of the final manuscript ninety different individuals have had a part. As far as the book in its entirety is concerned, it is written in an interesting style, is up-to-date and profusely illustrated with clear drawings and photographs.

The publisher has had the requirements of the student and the chemical worker in mind and produced the book in a new binding which is claimed to be completely waterproof and vermin-proof using a new method of pyroxylin impregnation of the cloth.

A. G. K.

Southern Gas Association

ANNOUNCEMENT has been made by B. B. Ferguson, president of the Southern Gas Association, of the appointment of new committees to carry on the important work of the association for 1933-1934. The committee members, who are chosen because of their outstanding ability and experience, are responsible for the major portion of the work undertaken by the Association during the year.

Following are the appointments to the various committees:

Commercial Section—W. A. Hudson, Chairman, W. D. Adams, Vice-Chairman, E. M. Cannon, H. S. Dossell, John C. Dyer, Stanley Grady, W. A. Melton, E. J. McGlinchey, J. A. McIntosh, E. G. Peabody.

Technical Section—David P. Allen, Chairman, C. L. Nairne, Vice-Chairman, M. N. Bailey, C. F. Carter, B. H. Elliott, W. P. Hutchinson, Henry Jones.

Industrial Section—O. F. Reynolds, Chairman, A. M. Spencer, Vice-Chairman, F. J. Evans, P. F. Hoots, L. S. Regan.

New Gas Company Formed in Kentucky

ARTICLES of incorporation of the North Middletown Gas Co. have been filed in the offices of the Secretary of State of Kentucky, at Frankfort. The new company will take over the Clintonville and North Middletown gas line that has for several years furnished gas to both towns. The incorporators are: Senator H. S. Caywood, D. R. Summay, Robert M. Gilkey, William Jones and Thomas C. Prewitt.

It's "Colonel Weedon" If You Please

John F. Weedon, advertising manager of the Peoples Gas Light & Coke Co., Chicago, Ill., has been appointed aide-de-camp on the staff of the Governor of the Commonwealth of Kentucky with the rank and grade of colonel.

TESTING LABORATORY

R. M. CONNER, Director

Managing Committee: J. S. DeHART, Jr., Chairman N. T. SELLMAN, Secretary

Changes in Water Heater Requirements Effective Immediately

A NEW requirement pertaining to the service efficiency, or "Heat Required to Supply Daily Quota of Hot Water," for automatic storage water heaters, was adopted by the Subcommittee on Approval Requirements for Gas Water Heaters, at a meeting held June 29-30, 1933, at the Testing Laboratory. This requirement was previously approved by the A. G. A. Approval Requirements Committee and is to go into effect immediately.

The new requirement is the result of research work conducted at the Laboratory and the subsequent development of a formula through cooperation with a special subcommittee appointed by the Approval Requirements Committee and headed by E. R. Weaver of the United States Bureau of Standards.

In adopting this requirement, the Water Heater Committee feels that the water heater code has been strengthened considerably. The change represents a definite forward step in the program to constantly improve the performance of gas appliances.

Sections of the performance requirements of the A. G. A. Approval Requirements for Gas Water Heaters affected by this action, and which will hereafter be enforced by the Laboratory in the testing of water heaters, follow:

Sec. 15. Thermal Efficiency

The corrected thermal efficiency of circulating, instantaneous and non-automatic storage water heaters shall be not less than 65 per cent.

a. Circulating Heaters, Types 3-A-1 and 4-A-1 and Instantaneous Heaters, Types 5-A and 5-B.

Method of Test

The heater to be tested shall be installed as shown in Exhibit B, the cold water connection being made at the inlet. The gas rate shall be adjusted at normal pressure to within plus or minus 5 per cent of the manufacturer's hourly B.t.u. input rating, and the air shutters adjusted to give good flames.

The temperature of the inlet water shall be maintained at room temperature, plus or minus 5° F.

The water temperature shall be adjusted by varying the rate of flow with the inlet valve until the outlet water temperature is constant at 60° F., plus or minus 2° F., above the inlet temperature. After the outlet temperature has become constant, as indicated by no variation in excess of 1° F. over a three-minute period, the outlet water shall be diverted from the waste line to the weighing container. A reading on the gas meter shall be taken at this time. Water is allowed to flow into the weighing container for exactly 30 minutes. At this time it is diverted back into the waste line, the meter reading noted and the weight of heated water recorded. Throughout the period of test, inlet and outlet water temperatures, as well as flue gas temperatures, shall be recorded every minute. Flue gas temperatures shall be taken just beyond the last active heating surface. During the tests, the temperature and heating value of the gas burned, barometric pressure and average room temperature shall be obtained.

Efficiencies shall be computed by use of the following formula:

$$E = \frac{W\,(T_2 - T_1)}{(CF \times G)\,H} \times 100$$

Where:

E = thermal efficiency, per cent.
W = total weight of water heated, lbs.
T_1 = average temperature of inlet water, ° F.
T_2 = average temperature of drained water, ° F.
CF = correction factor.
G = total gas consumed as metered, cu.ft.
H = total heating value of gas, B.t.u. per cu.ft.

b. Non-Automatic Combination Heaters and Water Storage Vessels, Type 3-A-2.

Method of Test

The system shall be assembled, following instructions furnished by the manufacturer, as shown in Exhibit D. The gas rate shall be adjusted at normal pressure to within plus or minus 5 per cent of the manufacturer's hourly B.t.u. input rating, and the air shutters regulated to give good flames. The temperature of the inlet water shall be at room temperature plus or minus 5° F.

Water shall be circulated through the heater until the inlet and outlet thermometers are constant. The gas at the burner shall then be lighted and allowed to burn until an amount of gas equivalent to 800 B.t.u. per gallon has been consumed, at which time the gas shall be shut off and the water in the storage vessel drawn out immediately from the bottom. When completely drained the storage vessel shall again be filled with water at room temperature. This procedure is to compensate for the heat in the storage vessel at the end of the test.

The gas at the burner shall again be lighted and allowed to burn until an amount of gas equivalent to 800 B.t.u. per gallon has been consumed. At the expiration of this time, the gas shall be shut off and the water again drained from the bottom. The heat content shall then be determined by allowing the water to flow into a container and reading temperature at 10-pound intervals, noting the total weight as well. During the test, temperature and calorific value of the gas, barometric pressure and temperature, flue gas temperatures, etc., shall be taken and recorded.

Efficiencies shall be computed by use of the following formula:

$$E = \frac{\left[\left(\frac{T_2 + T_1}{2} - T\right) D \times HL\right] + W\,(T_2 - T_1)}{(CF \times G)\,H} \times 100$$

Where:

E = thermal efficiency, per cent.
T = average room temperature, ° F.
T_1 = average temperature inlet water, ° F.
T_2 = average temperature drained water, ° F.
D = duration of test, hours.
HL = heat loss, B.t.u.
W = total weight of water drained, lbs.
CF = correction factor.
G = total gas consumed as metered, cu.ft.
H = total heating value of gas, B.t.u. per cu.ft.

Sec. 16. Method of Determining Heat Loss from Storage Vessels

The heat losses from the storage vessel shall be obtained by setting up the appliance as shown in Exhibit C. Inlet water shall be supplied at room temperature, plus or minus 5° F., and allowed to flow through the storage vessel until the inlet and outlet temperatures (T_1 and T_2) are constant. The gas shall then be lighted and regulated with a good adjustment to within 5 per cent of the manufacturer's hourly B.t.u. input rating.

For non-automatic combination heaters and water storage vessels, the gas shall be allowed to burn until an amount of gas equivalent to 800 B.t.u. per gallon of storage capacity has been consumed. The gas shall then be completely shut off and the water circulated through the system by means of the pump until an identical reading on thermometers T_1 and T_2 are obtained.

This temperature shall be recorded. The system shall be allowed to stand for a period of 6 hours. At this time the water shall again be circulated through the system until an identical reading on thermometers T_7 and T_8 are obtained. This temperature again shall be recorded.

For those systems employing a central flue, the flue outlet shall be capped when the gas supply is shut off.

The hourly heat loss in B.t.u. per degree difference in temperature between stored water and room shall be computed as follows:

$$\text{Heat Loss} = \frac{(T_1 - T_2)\,W}{D\left(\frac{T_1 + T_2}{2} - T\right)}$$

Where:

T_1 = temperature stored water at start of test, ° F.

T_2 = temperature stored water at end of test, ° F.

T = average room temperature, ° F.

D = duration of test, hours.

W = weight of stored water, pounds.

Where the storage vessel is totally surrounded by the flue gases no determination of the heat losses during the efficiency test is necessary.

Sec. 17. Heat Required to Supply Daily Quota of Hot Water

Every automatic storage water heater shall be capable of supplying a daily quota, Q, of water heated from room temperature through a temperature rise of 90° F. and shall further be capable of maintaining the stored water at the ultimate temperature specified above during that portion of 24 hours not required to heat the daily quota, with a total gas consumption in B.t.u. not in excess of 1667 Q.* This requirement shall be deemed met when the total heat required, as determined by the following formula, does not exceed 1667 Q:

$$75{,}000\,\frac{Q}{E_u} + 180\ VS - 562{,}500\,\frac{VSQ}{RE_u}$$

Where:

E_u = uncorrected thermal efficiency, per cent.

V = volume of stored water, U. S. gallons.

S = standby loss, per cent per hour, expressed as a percentage of the total heat content of the stored water above room temperature.

R = manufacturer's input rating, B.t.u. per hour, and

Q = daily quota, U. S. gallons of water heated through a temperature rise of 90° F.

$$= \frac{RV}{0.105RV^{1/3} + 48.06V}$$

Method of Test

1. Efficiency. The heater shall be installed following the instructions furnished by the manufacturer. Gas and water connections shall be made as shown in Exhibit D. The gas rate shall be adjusted at normal pressure to within plus or minus 5 per cent of the manufacturer's hourly B.t.u. input rating and the air shutters regulated to give good flames. The inlet water temperature for the purpose of all tests shall be maintained at room temperature, plus or minus 5° F.

Before starting any tests the setting of the thermostat shall first be obtained by starting with the water in the system at room temperature, plus or minus 5° F., and noting the maximum temperature of the water drawn from the hot water outlet immediately after the thermostat reduces the gas supply to a minimum. This temperature shall be 160° F., plus or minus 15° F.

When the thermostat reduces the gas supply to a minimum, the inlet water and main burner valves shall be closed and the water drained. After the system is emptied the drain valve shall be closed, the inlet water valve opened, and the system shall be filled at once with water at room temperature, plus or minus 5° F.

The meter reading shall be noted and the heater shall again be put into operation. When the thermostat reduces the gas supply to a minimum the inlet water and gas valve shall be closed immediately, the meter reading and time taken, and the water in the storage vessel drained. The heat content of the water shall be determined by allowing the water to flow into a container and reading its temperature at 10-pound intervals, noting the total weight as well. During this test, the temperature and calorific value of the gas, the room temperature, barometric pressure, and flue temperature shall be taken and recorded.

Efficiencies shall be computed by means of the following formula:

$$E_u = \frac{W\,(T_2 - T_1)}{(CF \times G)\,H} \times 100$$

Where:

E_u = uncorrected thermal efficiency, per cent.

W = total weight of water drained, pounds.

T_2 = average temperature of drained water, ° F.

T_1 = average temperature of inlet water, ° F.

CF = correction factor.

G = total gas consumed as metered, cu.ft., and

H = total heating value of gas, B.t.u. per cu.ft.

2. Stand-by Loss. For the purpose of this test the pilot or by-pass consumption shall be within the limits specified by the manufacturer.

The heater shall be installed following the instructions furnished by the manufacturer. Gas and water connections shall be made as shown in Exhibit D. The gas rate shall be adjusted at normal pressure to within plus or minus 5 per cent of the manufacturer's hourly B.t.u. input rating and the air shutters regulated to give good flames. The inlet water temperature for the purpose of all tests shall be maintained at room temperature, plus or minus 5° F.

The gas to the pilot or the by-pass gas shall then be lighted and the gas to the main burners turned on. The heater shall be allowed to cycle a sufficient number of times to insure the attainment of thermal equilibrium before beginning the test. The initial meter reading shall then be taken immediately after the thermostat reduces the main gas supply to a minimum and when the water temperature at the top of the storage vessel is constant, plus or minus 2° F., in the case of a graduating thermostat. The temperature at the top of the storage vessel shall be within the limits previously specified. The duration of this test shall be not less than 24 hours nor less than two cycles. The final meter reading shall be taken when the water temperature as recorded by the recording thermometer corresponds to the initial reading.

In the case of a snap or quick-acting thermostat the burner consumption shall also be taken from the time the thermostat opens until it closes for any cycle. The reason for this is to be able to compute the heat content of the stored water at the time when the thermostat turns on.

The room temperature shall not vary more than plus or minus 7.5° F. from the average during the test; temperature readings being taken by means of a recording thermometer and averaged at the end of the test. The calorific value of the gas, barometric pressure and gas temperature shall be taken at such intervals that a fair average may be obtained.

Immediately after the conclusion of the test the inlet water valve shall be closed and the average temperature of the stored water determined.

The average gas consumption, including pilot consumption, in B.t.u. per hour, expressed as a percentage, S, of the heat content of the stored water above room temperature shall be determined by the formula:

$$S = \frac{(CF \times G)\,H}{DW\,(T_2 - T)} \times 100$$

Where:

S = stand-by loss, per cent per hour, expressed as a percentage of the total heat content of the stored water above room temperature.

CF = correction factor.

G = total gas consumed as metered, cu.ft.

H = total heating value of gas, B.t.u. per cu.ft.

D = duration of test, hours.

W = weight of stored water, pounds.

T_2 = average temperature of stored water, ° F. and

T = average room temperature, ° F.

The Latest Marvel: Cooling of homes in summer by the same gas fuel that freezes water into ice cubes. On display at the World's Fair.

* The heat required for the purpose specified above by a heater with an uncorrected thermal efficiency of 65%, a standby loss of $27.14/V^{1/3}$% per hour of the heat content of the stored water above room temperature, and the same rating and storage capacity as the heater under test and which is designated a "standard heater" for the purpose of this requirement.

Survey of Corrosion Prevention In Water Heater Storage Tanks

By W. P. Cook and H. W. Smith, Jr.

THE life of a domestic water heating installation is largely determined by the rate at which corrosion proceeds within the hot water storage tank. Eventually this action may bring about a penetration of the tank walls in which case, the usefulness of the equipment is destroyed. The present-day corrosion problem has been attributed to several influences, for example, lighter tank construction, defective galvanizing, the trend of consumers toward the use of more and hotter water, adverse changes in the nature of water supplies, and improper selection, installation and care of water heating systems. Nevertheless, whatever the cause or causes, the corrosion of domestic hot water storage vessels has assumed the proportions of a major problem in domestic service.

Many investigators have studied corrosion problems and much material has been published on the subject, but as yet little work has been done in correlating the information gleaned and applying it to the domestic water heating field. Realizing this, the American Gas Association Testing Laboratory recently conducted a preliminary survey of present-day information relative to water heater tank corrosion, with a view to disclosing the avenues along which efforts toward practical tank corrosion prevention or retardation should be directed. This work has involved both detailed studies of published material and extended surveys of unpublished information and opinions from tank manufacturers, appliance manufacturers, gas companies, municipal water companies and hot water consumers. The results of that endeavor should be of interest to all concerned with elevating the quality of domestic hot water service. The function of this brief paper, however, is not to present a detailed report of that study, but merely to discuss certain salient facts and tendencies revealed by the broad surveys, interrogations, and studies of the Laboratory in connection with the practical aspects of minimizing water heater tank corrosion.

The failure of water heater boilers, by corrosive disintegration, is found to be most common in localities served with one of three types of water. These are:

(1) Notably soft waters having low mineral contents and low alkalinities, but containing appreciable quantities of dissolved oxygen.
(2) Unusually hard alkaline waters also having, generally, appreciable oxygen contents, and
(3) Acid waters.

The action of each of these waters in accelerating corrosion may be explained on the basis of the most generally accepted modern theory of corrosion, the Electro-Chemical theory,[1] as well as on the basis of extended researches of many investigators. From these sources, it is clear that many factors are known to contribute to the corrosiveness of water. Chief among these, in approximate order of importance, are:

(1) The concentration of oxygen dissolved in the water,
(2) The absence from the water of salts which assist in forming impermeable protective deposits on metals,
(3) The acidity (hydrogen-ion concentration) of the water,
(4) The presence in the water of corrosive chlorides or nitrates (particularly of magnesium), and
(5) The presence of dissolved gases other than oxygen.

Items (1) and (2) are chiefly responsible for the action of soft oxygenated waters; items (1), (4) and (5), for the effect of special hard alkaline supplies; items (3) and (5) for corrosion in acid waters.

Many methods have been developed and are now in use for retarding the corrosion of hot water storage vessels by the treatment of water supplies. Each, of course, has a special purpose depending on the type and volume of the water to be treated, but in general, these processes accomplish one of four things. They either degasify or deaerate waters, neutralize them, soften them, or inject salts which are conducive to the formation of protective deposits on tanks.

By processes of deaerating or degasifying water supplies, quantities of dissolved oxygen and carbon dioxide may be removed from boiler waters and their corrosive activity thereby enormously reduced. It has been demonstrated many times that dissolved oxygen, present in all natural waters, is the most important corrosive agent normally encountered in water heater operation, and that carbonic acid, found in many waters and formed by the solution of carbon dioxide, accelerates corrosion. Degasification has been recommended for years as a remedy for corrosion and has been used with marked success in a number of instances. In general, it constitutes the most effective known means of corrosion prevention. Several different varieties of degasifying units are available. The most of them rely upon heating, agitation, and suitable pressure conditions for removing the desired gases from the water. Usually deaeration or degasification is carried out on a large scale; individual units for domestic use with a single water heater are very rare.

In some localities the high hydrogen-ion concentration or acidity of the water supply is responsible for much trouble. This condition may be remedied by treating the water with an amount of some harmless base, such as slacked lime, sufficient to neutralize the supply, or at least lower its acidity considerably. Such neutralization processes may be applied on any scale desired. Care, however, must be taken, especially where relatively small amounts of water are being treated, to avoid adding excessive amounts of the base, which, if done, will render the water unduly hard.

Methods of water softening have also met with considerable success in preventing excessive corrosion, particularly in certain exceptionally hard water districts. Zeolite or permutite softeners for small installations and lime-soda ash treatments for larger water heating systems are frequently used. In these instances corrosion is deterred either through the precipitation of the notably corrosive magnesium compounds, or through the replacement of these salts by harmless soluble sodium or potassium compounds.

By the fourth type of water treatment, corrosion is often retarded by introducing into the supply, either at the installation or at the municipal water works, certain substances which cause the deposition of impervious protective coatings on all metal surfaces with which the water is in constant contact. At municipal plants water is sometimes limed, after the coagulants have been added, to establish a suitable relationship between the carbonates, bicarbonates, and dissolved carbon dioxide, which will foster the formation and maintenance of protective carbonate coatings on boiler interiors. Sodium silicate is often introduced into the water at the appliance by various means in order to increase the alkalinity of the water and to form a protective colloidal film or gel on the surface of the metal, thereby slowing up corrosive action. In one rather simple arrangement, treatment is effected by permitting hot water from a side-arm heater to flow at intervals through a by-pass line and container holding anhydrous silicate of soda.

So far this discussion has been concerned only with the abatement of corrosion by water supply treatment. Longer boiler life may be further fostered by suitably designing and constructing boilers with respect to corrosion. Several items, quite apart from the characteristics of the water supply, influence corrosive action. Among these are:

(1) The composition of the tank metal,

[1] Speller, F. N., "Corrosion—Causes and Prevention," pp. 6-49, McGraw Hill, 1926.

(2) The nature of the surface of the metal,

(3) The presence of other materials (mill scale, corrosion, products, etc.) on the metal, and

(4) Contacts between the tank metal and dissimilar metals also immersed in the water.

Each of these factors affects the length of service rendered by a water heating appliance, and must be considered in any comprehensive anti-corrosion program.

The majority of corrosion failures in hot water tanks occur either in top heads, near the bottom heads, or along seams. Oddly enough, surveys have indicated that, in most of the localities reporting top head penetrations to be the most frequent, highly oxygenated waters are supplied, whereas, in most of the localities reporting a predominant number of ruptures near bottom heads, hard waters are served. In the former districts corrosion difficulties have apparently been alleviated by properly redesigning top boiler heads to avoid such corners and recesses as might entrap any oxygen possibly separating out of the water. In the latter districts, beneficial results have been secured by some manufacturers by reshaping bottom heads. These changes in construction have made it possible to drain tanks more easily and completely, and at the same time, avoid the formation of pockets between the bottom head and shell where lime, dirt, or rust might accumulate.

The thickness of steel used in tanks undoubtedly has some influence on their life. The gauge of shells and heads must certainly be appreciably greater than that required for sufficient structural strength alone if satisfactory length of service is expected. In fact, most good water heater tanks now in use are fabricated from metal much heavier than that required only by considerations of strength. Particular attention should be devoted to the thickness of top and bottom heads.

With galvanized tanks great care should also be taken in applying a smooth, flawless, and ample coat of zinc. Defects of any kind in the galvanizing form excellent points at which localized corrosion may begin, and localized corrosion in turn usually brings about the removal of large patches of the galvanizing from the interior of the tank, so that bare steel is exposed. The steel is thus protected for a time at the expense of the zinc. It should further be remembered that zinc itself will corrode under certain conditions, and zinc coats must, therefore, be of ample thickness.

There are districts in the country in which the corrosiveness of the water is so severe that ordinary means of retarding corrosion fail to insure reasonable life of storage tanks. In such places it may be found advantageous to utilize tanks constructed of special materials.

A final item in the manufacture of water heater tanks, to be considered in precluding, in so far as possible, deterioration by corrosion, concerns accelerated localized corrosion resulting from the electrical contact of dissimilar metals immersed in water (a weak electrolyte). Such localized corrosion may occur in galvanized steel boilers equipped with copper or brass dip tubes, thermostat bodies, or other fittings. Some water heater manufacturers attach considerable importance to this effect and purport to eliminate it by either (1) electrically insulating copper or brass parts from the remainder of the boiler, thereby retarding the initial destruction of the galvanizing, or (2) tinning or chromium plating all copper or brass parts and thus minimizing the effect of dissimilar metals in contact by exposing to the water only metals close to one another in the electrochemical series. Some boilers constructed upon these principles are in use today and laboratory tests have been made which indicate favorable results, yet actual service tests of sufficient duration to prove the point have not yet been completed.

Although, as has been pointed out, corrosion may be retarded very appreciably by the several methods outlined above for both treating water supplies and rendering tanks more resistive to corrosion, to apply these methods usually requires considerable expense, either in installing water-treating equipment, in modifying boiler manufacturing processes, in redesigning appliances, or in supplying the energy or chemicals necessary for water treatment. Furthermore, if tank life is to be increased as a result of special construction or water treatment, each corrosion problem must be technically analyzed with respect to the causes of the trouble, and that particular action taken which corrects the specific difficulty encountered. Therefore, effective methods of combating corrosion, which neither require the additional expense of special equipment, supplies, or modifications, in manufacturing processes, nor technical analyses of the underlying causes of the corrosion encountered, would be highly desirable from a practical standpoint. Fortunately, there are several considerations involved in selecting, installing and operating water heating equipment which significantly influence corrosion rates and may be applied to corrosion abatement without expense or technical studies.

Whereas the methods so far discussed are probably the most effective means for avoiding corrosion difficulties, the suggestions to be made below represent more simple and feasible practices which, if universally followed, would accomplish a great deal in improving domestic hot water service.

The rate of water heater tank corrosion and the frequency of failures may be materially reduced if some scheme can be devised whereby the maximum available water temperature in domestic boilers is limited to not more than 135-140° F. It is definitely known that the life of a boiler is much less when supplying high temperature water (at 180-200° F. for example) than when supplying water at temperatures at approximately 140° F. Such facts have been borne out by the experiences of many manufacturers and gas companies. Hot water temperatures may be limited to advantage in a large proportion of installations, although, of course, instances arise in which it is necessary to provide for higher temperatures to meet special conditions. The distribution of explicit instructions concerning water temperature with each water heating unit sold might assist to some degree. It is believed that excessive water temperatures are more responsible for premature water heater tank failures than any other one factor.

Corrosion is accelerated, both with increasing water temperatures and increasing rates of flow of water past the surface subject to corrosion. In view of these facts, the length of serviceable life of a low storage capacity water heater tank is seriously curtailed if it is regularly required to supply a large demand for hot water. Excessive demands on a system require both higher water temperatures and more rapid flow through the boiler. Definite efforts should, therefore, be made to recommend water heater installations of sufficient storage capacity. Invariably, the increased life will more than compensate for the larger initial cost of a larger system.

One further item should be mentioned. Careless handling of galvanized boilers during shipment, delivery, or installation, may often so bruise or crack the interior zinc galvanizing that its protective properties as regards corrosion are destroyed or at least lessened. Pounding and dropping should be diligently guarded against, once the galvanizing process has been completed.

Thus, from the survey conducted by the American Gas Association Testing Laboratory, there seem to be three general methods by which the life of hot water storage vessels may be extended in any locality. These include: (1) treatment of the water supply, (2) proper precautions in tank construction, and (3) installation of water heater tanks of sufficient capacity coupled with precautions against overheating of the water. Each has its particular advantages and shortcomings. If all three of these methods were generally adopted and followed, a high degree of corrosion abatement would result. So far as is known, there is no procedure which absolutely eliminates corrosive action, but many have been found which so deter it that long serviceable life may be expected from water heater storage tanks.

There are 26,000 feet of mains carrying gas fuel to every part of the extensive grounds of the greatest of all World Fairs, the Century of Progress Exposition.

83 Years of A Century of Progress

Companies supply gas service to metropolitan Chicago, including The Peoples Gas Light and Coke Company, Public Service Company of Northern Illinois, Northern Indiana Public Service Company and The Western United Gas and Electric Company, have issued an attractively illustrated and interestingly written sixteen-page booklet. The title is "83 Years of A Century of Progress, the Gas Industry in Metropolitan Chicago."

The booklet sketches the history of Chicago when it was seventeen years old, a date marking the first use of gas light, down to the present moment. The last two chapters, "The Super-Gas System in Metropolitan Chicago," and "Natural Gas and the Future," are reproduced below:

"The Countryside Around Chicago, in the center of 'the world's most fertile and prosperous valley,' as geologists term it, was beginning to be populated when Chicago was known only as Fort Dearborn. In 1833, for instance, Michigan City, Indiana, had a population of over 3,000 as compared to Chicago's 350. Downstate, in Ottawa, a small settlement had been established in 1825, at the junction of the Fox and Illinois Rivers.

"It was the sudden activity in railroad building, beginning in 1850, that opened up the territory to settlers and made transportation of hogs and grain feasible. Five years later, in 1855, northern Illinois had a population of 117,620; the fertile valley was fast being fenced off into farm land, and small towns were growing up as way-stations for goods and people on their way to Chicago.

"The growth of this territory to the present day has closely paralleled the development of Chicago. And since 1900, when Chicago's most rapid population growth began, the Metropolitan area has been growing much faster than the city itself, as the network of utility services and the lines of transportation have been strengthened.

"It was in this territory that the interconnection of isolated public utility properties to form a strong, flexible, operating unit able to give much better service to each community than the individual plant, was first established. Other utility companies were quick to see the advantages to the public and the utility of this interconnection, and to follow suit.

"Today the territory of Metropolitan Chicago is underlaid with a vast system of interconnected gas mains, supplying gas service to small communities which otherwise could not have it, as well as to the larger towns and Chicago itself. Failure of service is almost an impossibility, since the facilities of the entire system can be rushed to the aid of a disabled part in case of any emergency.

"The importance to homes and industries of this interconnection is hard to over-emphasize. The economies in distribution and production made possible by large-scale methods have resulted in substantially lower gas rates for domestic and industrial purposes. Industries which located in Metropolitan Chicago because of its other advantages are finding that the low industrial gas rates are helping to solve the problem of heating in industrial processes.

"A policy of rate making that has for its purpose the extension of gas use into all possible fields of heating is helping to make these domestic and commercial and industrial uses possible. This policy, proved successful in the past, will be followed and developed further in the future.

"The year 1931 saw the completion of the world's largest and longest pipeline, which is now bringing natural gas from the Texas Panhandle and putting it to work in the homes and industries of Chicago.

"Natural gas had long been recognized as one of the nation's great natural resources, but the difficulty in utilizing it adequately had seemed too great to be overcome. The chief difficulty had been in transporting it from the sparsely settled and undeveloped regions in which it was found, to the populous industrial centers where it could be used.

"Two factors contributed to overcoming this difficulty. The first was the development of engineering and construction improvements which reduced the cost of building the pipeline. The second was the growth of the Chicago area, and its increasing potential demand for a larger supply of gas than could be produced in Chicago without great additional investment in gas producing equipment.

"Finally, the gas utilities in the Chicago area (not including the Indiana companies, which are not now distributing natural gas to their customers), joined with other companies owning gas-producing acreage in Texas in the construction of the 1,000-mile pipeline.

"The total investment in the project was $75,000,000, making the pipeline one of the world's largest private enterprises. Steel pipe—418,000,000 pounds of it, laid six feet beneath the surface of the ground—carries the gas at pressures as high as 600 pounds per square inch, a pressure thought impossible a few years ago. The daily capacity of the pipeline is 1,800,000 therms of gas.

"The reserves from which gas is taken—500,000 acres of gas-producing land—are sufficient to serve Metropolitan Chicago for many years to come, even with the anticipated increased use of gas for new heating applications, already being realized.

"But the story of this pipeline has not yet unfolded itself. The benefits to the Chicago area of having one of the world's largest gas reserves brought 'within the city limits' by the pipeline are too many and too complex, too involved with the future economic and social development of the region, to be possible of prediction at this time.

"We can reasonably envision a lightening of household burdens as more and more homes are heated automatically with gas. We can predict definite advantage to the manufacturer to whom gas is cheaply available for his heating needs, advantage of lower cost and of improved process.

"Because heat is essential to civilization, even to life. As we master the use of heat, whether to keep us warm or to cook our food or to generate electricity, we find the circumstances of daily living made more pleasant and secure.

"The service of Metropolitan Chicago's gas utilities in making available to the city the great resource of natural gas will gain steadily in value as gas heat grows into new fields of usefulness to the homes and industries of this region."

A.G.A. Members Named NIRA Committeemen

Executives of manufacturer member companies of the American Gas Association appointed by the Secretary of the Interior as members of committees operating under the National Industrial Recovery Act are as follows:

Thomas J. Watson, president, International Business Machines Corporation, New York; Committee on International Trade Relations.

James H. Rand, Jr., president, Remington Rand, Inc., New York; Subcommittee on Fees for Departmental Services.

Report on Competitive Test At Washington Available

NOW available at American Gas Association Headquarters is a report entitled "Comparative Test on Gas and Electric Kitchens in Two Welfare Association Cafeterias in Washington, D. C."

Here is a work which discusses the results of tests which were carried on in the gas-equipped Mall Cafeteria and the electrically equipped Internal Revenue Cafeteria. It definitely shows the favorable basis which gas enjoys in comparison to electricity in commercial kitchens and undoubtedly will prove valuable to all gas companies faced with competition in this field.

For redesigning the Mall Cafeteria, about twenty gas companies invested from $100 to $200 each, and it is believed that all gas companies will be glad to manifest their support of this project by studying the report. Its price is $1. Orders should be addressed to the American Gas Association, 420 Lexington Avenue, New York, N. Y.

Monthly Summary of Gas Company Statistics

FOR MONTH OF MAY, 1933

Issued July, 1933, by the Statistical Department of the American Gas Association
420 Lexington Avenue, New York, N. Y.

PAUL RYAN, Statistician

COMPARATIVE DATA ON THE MANUFACTURED AND NATURAL GAS INDUSTRY FOR THE MONTH OF MAY, 1933

	Month of May			*Five Months Ending May 31*		
	1933	*1932*	*Per cent Change*	*1933*	*1932*	*Per cent Change*
Customers						
Domestic (Including House Heating)	14,311,200	14,911,700	— 4.0			
Industrial and Commercial	958,000	980,100	— 2.3	*See May*		
Total	15,269,200	15,891,800	— 3.9			
Revenue (Dollars)						
Domestic (Including House Heating)	41,099,500	44,377,800	— 7.4	234,202,900	254,406,100	— 7.9
Industrial and Commercial	14,464,200	15,304,800	— 5.5	81,290,200	89,771,900	— 9.4
Total	55,563,700	59,682,600	— 6.9	315,493,100	344,178,000	— 8.3

COMPARATIVE DATA ON THE MANUFACTURED GAS INDUSTRY FOR THE MONTH OF MAY, 1933

	1933	*1932*	*Per cent Change*	*1933*	*1932*	*Per cent Change*
Customers						
Domestic	9,281,200	9,760,900	— 4.9			
House Heating	57,700	57,400	+ 0.5			
Industrial and Commercial	478,800	493,900	— 3.1	*See May*		
Miscellaneous	8,000	7,400	—			
Total	9,825,700	10,319,600	— 4.8			
Gas Sales (MCF)						
Domestic	21,481,300	23,354,300	— 8.0	106,056,400	115,791,300	— 8.4
House Heating	1,448,500	1,465,000	— 1.1	14,060,100	14,438,300	— 2.6
Industrial and Commercial	6,864,400	6,964,800	— 1.4	33,347,800	37,173,300	—10.3
Miscellaneous	142,500	151,400	—	859,200	909,600	—
Total	29,936,700	31,935,500	— 6.3	154,323,500	168,312,500	— 8.3
Revenue (Dollars)						
Domestic	25,421,700	27,922,400	— 9.0	125,528,900	138,437,500	— 9.3
House Heating	1,013,900	1,117,600	— 9.3	9,547,800	10,685,500	—10.6
Industrial and Commercial	5,648,600	6,214,000	— 9.1	28,618,000	32,994,100	—13.3
Miscellaneous	120,600	115,300	—	614,500	617,700	—
Total	32,204,800	35,369,300	— 9.0	164,309,200	182,734,800	—10.1

COMPARATIVE DATA ON THE NATURAL GAS INDUSTRY FOR THE MONTH OF MAY, 1933

	1933	*1932*	*Per cent Change*	*1933*	*1932*	*Per cent Change*
Customers						
Domestic (Including House Heating)	4,972,300	5,093,400	— 2.4			
Commercial	451,200	457,800	— 1.4			
Industrial	14,100	14,000	+ 0.7	*See May*		
Main Line Industrial	4,200	4,900	—14.3			
Miscellaneous	1,700	2,100	—			
Total	5,443,500	5,572,200	— 2.3			
Gas Sales (MCF)						
Domestic (Including House Heating)	20,687,000	21,327,900	— 3.0	157,496,300	165,936,400	— 5.1
Commercial	5,984,400	6,007,100	— 0.4	46,621,200	47,149,700	— 1.1
Industrial	25,566,900	25,746,100	— 0.7	132,225,800	140,257,500	— 5.7
Main Line Industrial	9,088,500	8,115,300	+12.0	51,690,100	45,683,500	+13.1
Miscellaneous	768,600	713,700	—	3,847,400	4,384,800	—
Total	62,095,400	61,910,100	+ 0.3	391,880,800	403,411,900	— 2.9
Revenue (Dollars)						
Domestic (Including House Heating)	14,663,900	15,337,800	— 4.4	99,126,200	105,283,100	— 5.8
Commercial	2,775,400	2,870,200	— 3.3	20,649,400	21,554,700	— 4.2
Industrial	4,873,400	5,061,400	— 3.7	25,157,200	28,428,300	—11.5
Main Line Industrial	955,300	959,100	— 0.4	5,599,900	5,467,900	+ 2.4
Miscellaneous	90,900	84,800	—	651,200	709,200	—
Total	23,358,900	24,313,300	— 3.9	151,183,900	161,443,200	— 6.4

Industrial Gas Sales Register Gains

REVENUES of the manufactured and natural gas industry aggregated $55,563,700 for May, 1933, as compared with $59,682,600 for May, 1932, a decline of 6.9 per cent.

The manufactured gas industry reported revenues of $32,204,800 for the month, a drop of 9 per cent from a year ago, while revenues of the natural gas industry totalled $23,358,900 or 3.9 per cent less than for May, 1932.

Sales of manufactured gas reported for May totalled 29,936,700,000 cu.ft., a decline of 6.3 per cent. Natural gas sales for the month amounted to 62,095,400,000 cu.ft., a figure approximately equal to the volume sold during the corresponding month a year ago.

The relatively better showing of the natural gas companies was the result of a pronounced increase in sales to large scale industrial users. In May, 1932 sales for this purpose amounted to 8,115,300,000 cu.ft., but in May, 1933 rose to 9,088,500,000 cu.ft., a gain of 12 per cent.

This increase in industrial gas sales was prevalent in most natural gas territories, reflecting the pronounced gains in industrial activity and production registered during the month. In New York, sales of natural gas for industrial purposes increased more than 46 per cent, while in Ohio the gain in this class of business was nearly 27 per cent.

The Mid-continent area also registered pronounced gains in industrial sales, the increase amounting to 12 per cent in Kansas and 9 per cent in Texas, while in Oklahoma ordinary industrial sales increased 26 per cent and sales to main line or large scale industrial users were up 47 per cent.

Brooklyn Poly Plans New Course in Industrial Gas Engineering

(Continued from page 337)

burners, and also of pyrometers, metering, and other equipment needed for complete testing. In addition to this regular equipment there are at present several furnaces under construction for the exclusive use of the new course in the experiments enumerated above. Inspection of the facilities is invited.

The course is open to those who work in industrial gas applications or who are interested in them. The practice to be gained should prove of especial value to those who have to solve industrial heating problems of unusual nature as they arise.

Registration will be limited in number to those who can be efficiently instructed with the facilities organized.

The course will be under the direction of Professor E. F. Church, Jr., head of the Department of Mechanical Engineering, to whom inquiries should be addressed. The instructors will be members of the staff of the Polytechnic Institute, assisted by experts from the gas industries. The address of the Institute is 99 Livingston Street, Brooklyn, N. Y.

Rubber Tires Made by Gas at Chicago Fair

(Continued from page 322)

a tire testing machine which duplicates the gruelling wear and abrasion of actual road conditions, at a high rate of speed, to show the superior physical characteristics of these tires that would otherwise be revealed only by thousands of miles of service over a period. of many months. New product developments and interesting displays of automotive racing are also shown.

Increases Gas Heating Sales

(Continued from page 318)

omission of any reasonably good prospect. List-making of this kind is hard work and costs money, but it saves far more than it costs.

In 1932 the number of our gas heating customers was increased from 800 to 1,200. Every installation was a legitimate sale. Sixty-five per cent of the installations were made by dealers. After a full winter's experience the new customers are satisfied and pleased. A substantial addition has been made to our permanent business at a cost that represents a satisfactory investment in relation to the year's volume, while providing a highly pleasing addition to future revenue.

Does the Gas Industry Want the Domestic Kitchen Load?

(Continued from page 334)

(c) Dimension for convenient placing.

(d) Vented or partially vented.

(e) Automatic temperature control.

The availability of a proper type kitchen heater will go a long way to open up this highly profitable market. However, it alone will not solve the problem. A careful review of the cost of the domestic gas supply and the availability of profitable but competitive rates would appear to be equally important. When the proper equipment is designed and competitive rates are available, preferably of uniform structure, a cooperative educational campaign should be undertaken, in order to meet our competitors on an equal and united footing, with every assurance of vast improvement in earning capacity of New England gas companies.

Graphic Picture of Smoke Evil

(Continued from page 316)

mination. "I believe," says he, "that an informed public would speedily become such a militant influence, if the facts were known, that the violators of an anti-smoke code would accept any reasonable penalty rather than submit their case to the deliberations of a jury."

An aroused public opinion—that is the nub of the whole problem. Is there not an obligation and an opportunity here for the gas industry, purveyors of the cleanest fuel on earth?

By arrangement with Harper & Brothers, the American Gas Association is able to sell copies to its members at substantial discounts, as follows: Single copies, $2.25; five copies, $2.00 each; ten copies or more, $1.75 each. The price to non-members is $2.50 a copy.

It is recommended that company members, in placing orders, give thought to the following distribution of the book:

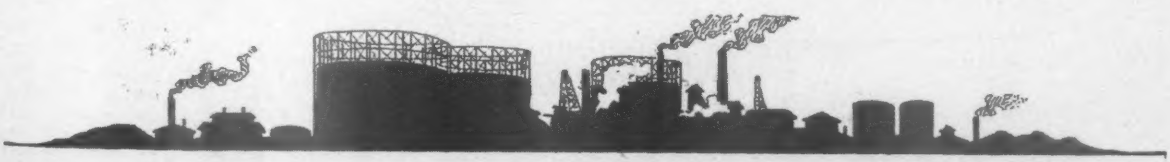
Copies for the company's general library and for each executive officer, sales manager, industrial gas engineer, advertising manager and home service worker.

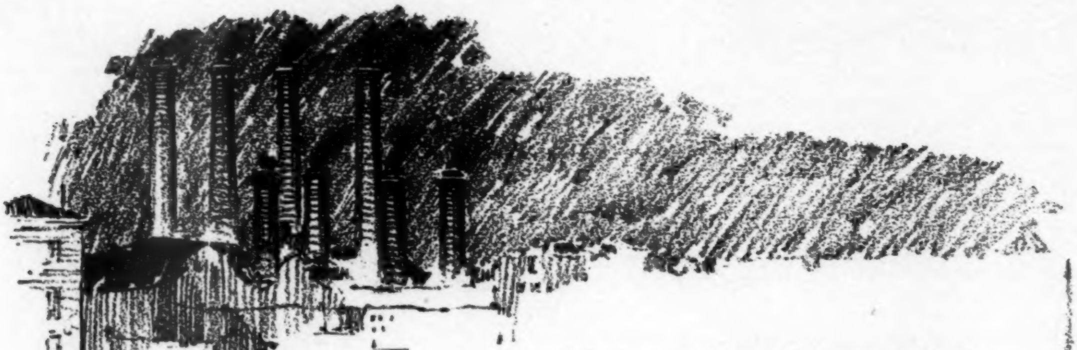
Distribution to public and other libraries. Usually they are limited in funds and will welcome by letter or personal contact copies to main public library and to each branch. The book is of special value to medical and engineering libraries.

Public health officials, the heads of local medical societies, and any physicians interested in the anti-smoke movement.

Smoke abatement officials, officers of women's clubs, chambers of commerce, heads of civic clubs, social service organizations, civic planning bodies, taxpayers' associations, etc.

Editors of local papers and lecturers and others known as active campaigners against the smoke nuisance.





Associations Affiliated with A. G. A.

Canadian Gas Association

Pres.—Hugh McNair, Winnipeg Electric Co., Winnipeg, Man.

Sec.-Tr.—G. W. Allen, 21 Astley Avenue, Toronto.

Empire State Gas and Electric Association

Pres.—Alfred H. Schoellkopf, Niagara Hudson Power Corp., Buffalo, N. Y.

Chairman, Gas Section—A. M. Beebee, Rochester Gas & Electric Corp., Rochester, N. Y.

Sec.—C. H. B. Chapin, Grand Central Terminal, New York, N. Y.

Illinois Public Utilities Association

Pres.—Bernard J. Mullaney, The Peoples Gas Light & Coke Company, Chicago, Ill.

Sec.—J. R. Blackhall, Suite 1213, 79 West Monroe St., Chicago, Ill.

Indiana Gas Association

Pres.—R. S. Brunner, Indiana Gas Utilities Co., Richmond, Ind.

Sec.-Tr.—P. A. McLeod, New Castle, Ind.

Michigan Gas Association

Pres.—Walter E. White, Commonwealth & Southern Corp., Jackson, Mich.

Sec.-Tr.—A. G. Schroeder, Grand Rapids Gas Light Co., Grand Rapids, Mich.

Maryland Utilities Association

Pres.—F. A. Mitchell, Eastern Shore Public Service Co., Salisbury, Md.

Sec.—D. E. Kinnear, 803 Court Square Bldg., Baltimore, Md.

Mid-West Gas Association

Pres.—R. L. Klar, Des Moines Gas Co., Des Moines, Iowa.

Sec.-Tr.—Roy B. Searing, Sioux City Gas & Electric Co., Sioux City, Iowa.

Missouri Association of Public Utilities

Pres.—Fred Karr, St. Joseph Gas Co., St. Joseph, Mo.

Sec.-Tr.—N. R. Beagle, Missouri Power & Light Co., Jefferson City, Mo.

Asst. Sec.—Jesse Blythe, 103 West High St., Jefferson City, Mo.

New England Gas Association

Pres.—H. R. Sterrett, New Haven Gas Light Co., New Haven, Conn.

Vice-Pres.—F. M. Goodwin, Boston Consolidated Gas Co., Boston, Mass.

Second Vice-Pres.—R. H. Knowlton, The Connecticut Light & Power Co., Hartford, Conn.

Treas.—F. D. Cadwallader, Boston Consolidated Gas Co., Boston, Mass.

Exec. Sec.—Clark Belden, 41 Mt. Vernon St., Boston, Mass.

Chairman, Operating Div.—P. R. Buchanan, Hartford Gas Co., Hartford, Conn.

Sec.-Tr., Operating Div.—D. R. Campbell, Portland Gas Light Co., Portland, Me.

Chairman, Sales Div.—H. B. Hall, Old Colony Gas Co., East Braintree, Mass.

Sec.-Tr., Sales Div.—R. J. Rutherford, Cambridge Gas Light Co., Cambridge, Mass.

Chairman, Industrial Div.—P. A. Nelles, Charles H. Tenney & Co., Boston, Mass.

Sec.-Tr., Industrial Div.—S. F. Morgan, New Bedford Gas & Edison Lt. Co., New Bedford, Mass.

Chairman, Accounting Div.—Leland Balch, Lowell Gas Light Co., Lowell, Mass.

Sec.-Tr., Accounting Div.—C. D. Perkins, Malden & Melrose Gas Light Co., Malden, Mass.

Chairman, Manufacturers Div.—C. H. Cummings, Industrial Appliance Co. of N. E., Boston, Mass.

Sec.-Tr., Manufacturers Div.—J. H. McPherson, James B. Clow & Sons, Boston, Mass.

New Jersey Gas Association

Pres.—F. A. Lydecker, Public Service Electric and Gas Co., Newark, N. J.

Sec.-Tr.—G. B. Webber, Public Service Electric and Gas Co., Newark, N. J.

Ohio Gas and Oil Men's Association

Pres.—L. K. Langdon, Union Gas & Electric Co., Cincinnati, Ohio.

Sec.-Tr.—Wm. H. Thompson, 811 First National Bank Bldg., Columbus, Ohio.

Oklahoma Utilities Association

Pres.—R. J. Benzel, Southwestern Bell Telephone Co., Oklahoma City, Okla.

Mgr.—E. F. McKay, 1020 Petroleum Bldg., Oklahoma City, Okla.

Pacific Coast Gas Association

Pres.—Harry L. Masser, Los Angeles Gas and Electric Corp., Los Angeles, Calif.

Mang. Dir.—Clifford Johnstone, 447 Sutter St., San Francisco, Calif.

Pennsylvania Gas Association

Pres.—F. M. Milward Oliver, The Philadelphia Gas Works Co., Philadelphia, Pa.

Sec.—Frank W. Lesley, Pennsylvania Gas & Electric Co., York, Pa.

Pennsylvania Natural Gas Men's Association

Pres.—F. F. Schauer, Equitable Gas Co., Pittsburgh, Pa.

Sec.-Tr.—B. H. Smyers, Jr., 435 Sixth Ave., Pittsburgh, Pa.

Southern Gas Association

Pres.—B. B. Ferguson, Portsmouth Gas Co., Portsmouth, Va.

Sec.-Tr.—S. L. Drumm, New Orleans Public Service Inc., New Orleans, La.

Southwestern Public Service Association

Pres.—Knox Lee, Southwestern Gas & Electric Co., Marshall, Texas.

Sec.—E. N. Willis, 1801 No. Lamar St., Dallas, Texas.

The Public Utilities Association of Virginia

Pres.—T. Justin Moore, Va. Elec. & Power Co., Richmond, Va.

Wisconsin Utilities Association

Pres.—R. G. Walter, Wisconsin Power & Light Co., Madison, Wis.

Exec. Sec.—J. N. Cadby, 135 West Wells St., Milwaukee, Wis.

International Gas Conference
AND
Fifteenth Annual Convention of the American Gas Association

Chicago, Ill.

Sept. 25-26-27-28-29, 1933

Personnel Service

SERVICES OFFERED

Gas engineer qualified for company management or supervision of operating procedure; practical specialist in high and low temperature carbonization including preliminary research. First class technical background with extensive operating and managerial experience. As plant results engineer for large property or holding company, could secure and maintain maximum efficiency with present equipment. **730.**

Sales Executive: exceptional background, innumerable contacts, successful record merchandising gas, electric domestic, industrial service, appliances, training, and handling salesmen, advertising publicity, cost analyses, rate designing, public relations and general sales promotion; widely traveled expert negotiator, convincing personality, aggressive, tactful, creative, resourceful; can quickly visualize any situation and develop possibilities. **731.**

Qualifications arising out of eighteen years' broad auditing and **accounting** experience in varied lines including five years, large combination property, plus special courses in accountancy, at disposal of manufacturer of gas and electric equipment or gas and electric corporation. Public work has rounded out customary utility experience thus creating a more valuable asset. **732.**

Wanted to make connection as **Manufacturers Agent,** or with sales office, of concern manufacturing cast iron pipe and etc., or kindred lines such as valves or similar appliances. Can furnish record and details of past experience in these lines. **733.**

Technical graduate, 1931, single, specialized in gas and **chemical engineering,** with experience in several industrial concerns, also in testing heating equipment at university experiment station, interested in development and experimental work, willing to go anywhere and to consider any position regardless of salary; now in the East. **735.**

Civil and **Gas Engineer.** Experience covers design and construction of over one thousand miles of natural gas pipe lines; forty city distribution systems; six natural gas compressor stations aggregating ten thousand horse power. Good geologist and map maker. Executive experience, twelve years' chief engineer, five land agent, two purchasing agent. **736.**

Seven years' new business manager of manufactured gas plant of 15,000 meters and three years' manager of natural gas property of 3,000 meters. Specialized training in gas heating. Would like to make a connection with a gas utility in **supervisory** or executive capacity; age 42. **737.**

Can you use an experienced **house heating** salesman with recent successful sales record? Familiar with West and middle West problems; competent in both natural and manufactured gas utilization. Services available immediately. **738.**

Domestic **coke service** man (35) technically trained. Thoroughly experienced in burning coke in small and medium sized furnaces, with background of research and position with one of the largest producers of domestic coke. Capable of handling service and customer contact department of a company; experienced in coke production and sales. **740.**

Gas engineer (B.S., Chemical Engineering). Eight years' experience in operation of gas plants and by-product coke plants. Wide experience in development of new processes, design and construction of equipment and patent prosecution covering all phases of the gas industry. Desire responsible position in operating or engineering department. **742.**

Engineer (M.E.) with seven years' practical experience as engineer and superintendent all departments (water gas, coal gas and natural gas operation) starting as cadet, desires position in engineering or operating capacity. Two years' experience with heavy oil. Single (30) willing to go anywhere United States or foreign service. **743.**

SERVICES OFFERED

Gas and **fuel engineer** with additional training in metallurgy and ceramics. Experienced in research and varied industrial fields involving application of heat. Employed last four and one-half years as research fellow in ceramics department of well known university. Will go anywhere in U. S. Married (28). **744.**

Engineer; M.S. in M.E., major in Gas Engineering. Four years' operating and allround experience including utilization engineering with large natural gas utility; married; (29); willing to go anywhere. **745.**

Sales executive-engineer; university graduate. Seven years' blast furnace and coke plant operating experience followed by seven years' sales experience industrial gas combustion equipment, industrial furnaces, and heavy plant equipment—wishes position in **equipment sales** or industrial department of strong company. Married (36). **746.**

Manufacturing engineering **executive:** technical education, desires connection with reliable gas range or appliance manufacturer. Formerly chief engineer of two well known gas range companies. Capable complete charge of development, experimental, laboratory, research departments. Understand vitreous enamel application from start to finish. **747.**

Gas engineer with twenty years' operating and managerial record. Experienced heavy oil operation, reforming natural gas and mixing of manufactured and natural gases. Qualified in sales promotional work and industrial application of gas. Formerly research assistant, public utility management at well known graduate school. Open for permanent or temporary connection. **748.**

Sales engineer—eighteen years' experience covers industrial steam boiler application, large volume water heating and management of house heating department in all its branches of service. Broad general and technical knowledge of all heat using industries; experience includes surveys, sales work, installation supervision and operating "follow up." Married. **749.**

Appliance salesman capable of selling and handling any territory. Have ability to supervise salesmen, manage a stove department, create new business and equipped with knowledge of the stove business in general. Location secondary consideration. **750.**

Development and **Sales Engineer** (M.E.) having eighteen years' gas and electric company, as well as large oil burner company sales experience. Established enviable record in electric and gas industrial sales and pioneered development and did much original work in central gas heating and air conditioning equipment. **751.**

Sales Engineer with technical experience and with thorough knowledge of all branches of the gas business offers his services to company seeking representative for sales development work among gas and oil companies. Can produce results. This is a real opportunity to secure services of a high class man. **752.**

House heating engineer (25) graduate of a gas engineering school, B.S. and M.S. with advanced work in heating and ventilating. Have two years' experience in house heating. Desire employment in either house heating or industrial sales work. **753.**

Man well qualified by education and experience to head the **Industrial** Department of a large utility. Resourceful, creative, aggressive authority on industrial gas usage and technology. Useful in consulting capacity, reports clearly, in non-technical language. Responsible position sought. **754.**

Plumbers' Good Will—Friendly cooperation and support for gas appliances! Can be had by employing right man! Over six years' countrywide, proven success, producing similar reactions among plumbers; plus well rounded **sales-promotional** experience. Proof of qualifications immediately available. Compensation ideas reasonable. Can you use me? **755.**

SERVICES OFFERED

Manufacturers' Representative. Now engaged as salesman and engineer by natural gas utility in all phases of company's business. Previous to gas experience was for six years sales engineer and district salesmanager for large national manufacturer of fuel burning equipment. Engineering college graduate. Married (38). First preference southeast. **756.**

Industrial fuel **sales engineer.** Experience gained with Eastern utility. College graduate, member A.S.M.E. Qualified make surveys, design burners, piping and auxiliaries. Familiar with all principal metallurgical operations, ceramics, baking, etc. Understands space heating and air conditioning. Experience, and outstanding sales ability sufficient take charge territory or department. **757.**

Young engineering graduate (28) with six and one-half years' experience in **managing** the operating detail of small gas companies, would like to take complete charge of and be responsible for a small company and devote his training and experience to the improvement of its service and earnings. **758.**

Manager, natural gas, manufactured gas and electricity. Excellent record in developing rundown properties and obtaining new business. Can reduce expenses and make money. **759.**

Young engineering graduate having five years' practical experience in design, manufacture, erection and **operation** of gas plant equipment; thoroughly familiar with modern water gas production in a large city seeks position as assistant or understudy to superintendent in smaller community. Married. **760.**

Position wanted with appliance manufacturer. Experience includes executive training, and covers over fourteen years in the **sale** of tin gas meters. Offers character, integrity and ability with service. Thoroughly conversant with **management** problems. Would prefer position in the East. **761.**

POSITIONS OPEN

Nationally known manufacturer of **water heaters** has available territory open. Would like applicants to forward qualifications, experience, etc. relative to same. **0256.**

Middle West gas company has an opening for a man experienced in **sales promotion** and customer relations. Would like applicant to state qualifications, experience, etc. in first letter. **0259.**

Sales manager to have charge of sales force handling all the domestic gas sales in a district of large combination company. Full record of qualifications and sales experience should be included in application; age 30 to 40 years. **0260.**

LETTERS AND A SEQUEL

"We send you confidential classification records of men who appear to have some or all of the qualifications required for the position you have open."—From very recent letter to a company.

"We regret we did not have just the kind of man you want. Let us place an advertisement which right now would prove a distinct addition to the morale of the industry."—From letter to same company.

The sequel is another "POSITIONS OPEN" advertisement.

We were told that the matter of morale carried considerable weight.

Advisory Council

PRINTED IN U. S. A.